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Final Report On Water Resources
And
Related Land Management
AD-A236 558



Buffalo Metropolitan Area, N.Y. Water Resources Management

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US Army Corps
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Buffalo District

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DEPARTMENT OF THE ARMY
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REPLY TO
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FINAL REPORT
ON
WATER RESOURCES AND RELATED LAND MANAGEMENT
IN
THE BUFFALO METROPOLITAN AREA, NEW YORK

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EXECUTIVE SUMMARY

This final report includes a brief summary of the four previously completed interim studies for the Buffalo Metropolitan Area Study and serves as the final report on the feasibility of flood management for the Buffalo River and Lower Tonawanda Creek.

The titles and completion dates for the four interim studies are:

- Feasibility of Flood Management, Cayuga Creek Watershed - May 1975
- Feasibility of Flood Management, Cazenovia Creek Watershed - March 1975
- Feasibility of Comprehensive Water and Related Land Management -
December 1975
- Feasibility of Flood Management, Tonawanda Creek Watershed - July 1983

Of the four interim studies, three addressed flood management in the Cayuga, Cazenovia, and Upper Tonawanda Creek watersheds. The fourth study identified a practical development plan for improving recreation access and related water and land management in the Buffalo Metropolitan Area, particularly along the Niagara Riverfront. This December 1975 Comprehensive Study also addressed region-wide programs to manage wastewater, floating drift, and streambank stabilization. Other matters related to water supply, water quality, environmental quality, and fish and wildlife, were also investigated and appraised in the Comprehensive Study. The status of the projects recommended in the first four interim reports is as follows:

1. A local flood protection project for Cayuga Creek in the town of Cheektowaga, New York, was constructed in December 1982 under Section 205 Authority. The cost of the completed project, consisting of an earthen levee upstream from Union Road bridge providing 100-year protection, was \$1,235,195.
2. The flood management project for Cazenovia Creek was continued under Section 205 Authority. Plans and Specifications for the recommended project, an ice control structure in West Seneca, New York, are substantially complete. In December 1988, the New York State Department of Environmental Conservation (NYSDEC), the local sponsor, requested that the project be placed in a "deferred" status until the State's fiscal situation improves and agreements can be reached with the town of West Seneca on construction cost-sharing. The recommended "ice control structure" plan for Cazenovia Creek has an estimated total first cost of \$2,148,000, and a benefit-cost ratio of 1.5, based on April 1988 price levels.
3. The recommended project for the Upper Tonawanda Creek watershed consists of two shallow detention reservoirs (normally dry) just upstream of the city of Batavia, New York. The recommended project, referred to as the Batavia Reservoir Compound - Modified (BRC-M), was not supported by the potential sponsor, NYSDEC, and has not been authorized for construction. The BRC-M has an estimated total first cost of \$33,200,000, and a benefit-cost ratio of 1.04 based on October 1988 price levels.
4. The full development plan recommended in the interim report on recreation access and related water and land management has an estimated total first cost of about \$5,100,000 on 1975 price levels and a benefit-cost ratio

for full development of 3.5. Corps cost for participation in the plan is limited to existing maintenance responsibilities for the Black Rock Channel and Tonawanda Harbor, New York, project. A major portion of the recommended recreation access plan has been implemented by State, county, and local governments since publication of the plan in December 1975.

This report on the Buffalo River/Lower Tonawanda Creek is the final report in response to the study authorization which requested determination of the feasibility of providing flood protection in the Buffalo Metropolitan Area, New York. This report was prepared using the Principles and Guidelines, and other applicable laws and regulations.

The study area is located in Western New York and includes about 163 of the 650 square miles in the Tonawanda Creek Watershed and about 20 of the 431 square miles in the Buffalo River Watershed. Along the lower Tonawanda Creek, downstream to the Niagara River from Black Cutch Road in the town of Royalton, the existing flooding problem causes nearly \$1,620,000 in average annual damages to existing urban and agricultural development, and could potentially cause increasing future damage as the area faces increasing pressure for residential development. In addition, farmers are unable to make full and productive use of the fertile soils within the flood plain due to frequent flooding. Along the Buffalo River, the existing flooding problem causes nearly \$110,000 in average annual damages to existing urban development.

For the Buffalo River portion of the study area, an examination of the impacts of reduced maintenance dredging on flood damages was conducted. The impacts of shoaling within the navigation channel of the Buffalo River, except for those complicated by ice, were examined. The shoaling impacts examined were found to be insignificant and further study of the Buffalo River was terminated.

For the lower reaches of Tonawanda Creek, prior studies have resulted in implementation of localized solutions to problems by non-Federal interests. These solutions include clearing and snagging of Black and Ransom Creeks by the town of Amherst and similar improvements made by the State on many of the small tributaries. Regional flood management problems were addressed in previous studies; however, regional solutions have not been implemented. The primary planning objective of this current study was to reduce urban and agricultural flood damage. Planning criteria for this study included the need to: determine the Federal interest; insure proposals meet with current guidelines, laws, and regulations; and insure that the solution has local support.

A wide range of alternative plans were investigated as solutions to the flooding problem along the Lower Tonawanda Creek including nonstructural and structural measures. The structural plans concentrated on regional flood protection and included local flood protection. These plans were formulated using appropriate planning criteria, and input from the public and affected and interested agencies. The plans were evaluated for engineering, economic, and environmental feasibility, and were compared to select the plan which best meets all tests.

For the Lower Tonawanda Creek watershed, the Ransom Creek Channel Improvement alternative (Plan 4) was the Tentatively Selected Plan. The principal features of this plan include improvement and modifications to the Ransom Creek channel,

minor improvements on Black Creek, and diversion of water out of the Tonawanda Creek Watershed through the New York State Barge Canal. The plan is limited to providing only 25-year flood protection for the major damage areas. This plan would reduce the existing average annual flood damages by about 23 percent. The estimated total first cost of Plan 4 is \$1,940,000. The economic efficiency of the tentatively selected plan, based on an economic life of 50 years and an interest rate 8-7/8 percent, is 1.6. The average annual costs of the plan, including costs for operation, maintenance, and repair are \$194,900. The average annual benefits of the plan are \$311,300.

Construction of the Tentatively Selected Plan 4 would reduce flood damages in the Ransom Oaks community while having a minimal impact on the natural environment. Plan 4 considered the findings of earlier reports, the planning objectives and criteria, the means of eliminating or mitigating possible adverse social, regional, and environmental impacts associated with its implementation, and attempted to address the views of local interests. The New York State Department of Environmental Conservation (NYSDEC) is the local sponsor for all flood control projects within New York State and as such must represent all of the separate local governments affected by the plan. The planning process eliminated all regional alternatives because of lack of economic justification and, at best, could only offer Plan 4 to address the localized needs of a portion of the study area. However, when all of the advantages, disadvantages, and unresolved issues were considered, NYSDEC requested that the study of Lower Tonawanda Creek be placed in a deferred status until a final determination of possible changes in the flood plain in Amherst and Clarence is made by the Federal Emergency Management Agency.

NYSDEC's decision not to support a preferred plan at this time, coupled with the knowledge that Plan 4 would provide a low level of protection (25-year) and the institutional problem that could occur in diverting flood waters through the Barge Canal lead the Corps to select the "No-Action" (do nothing) Plan and recommend termination of the study. It is further recommended that the authority for the Buffalo Metropolitan Area Study be closed out as no further Federal action is appropriate under the Buffalo Metropolitan Area Study at this time.

FINAL REPORT
ON
WATER RESOURCES AND RELATED LAND MANAGEMENT
IN
THE BUFFALO METROPOLITAN AREA, NEW YORK

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INTRODUCTION

This section explains the study purpose and authority; the study process; the scope of the study; the study participants and associated coordination; the prior studies, reports, and existing water projects; and the organization of the report.

STUDY AUTHORITY

Authorization for a Buffalo Metropolitan Area Study derives from a resolution of the House Committee on Public Works sponsored by Congressman Jack F. Kemp and adopted on 14 June 1972 which reads:

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Cazenovia Creek, and Cayuga Creek, NY, submitted in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to providing improvements in the interest of flood control, wastewater management, water supply, water quality, environmental quality, recreation and fish and wildlife for the Buffalo River Basin, NY."

The Buffalo Metropolitan Area includes the Buffalo River Basin and the Buffalo urban area. On 5 March 1973, HQUSACE authorized enlargement of the study area to include the Buffalo urban area (SMSA) and redesignated the study "Buffalo Metropolitan Area, NY." The study area is shown on Plate 1. Portions of Chautauqua, Cattaraugus, Allegany, Wyoming, Genesee, and Orleans Counties are included in the study area along with all of Erie and Niagara Counties. The Buffalo SMSA includes all of Erie and Niagara Counties.

STUDY PURPOSE AND SCOPE

This report summarizes the alternative water and related land management plans developed throughout the overall study that were compatible with the comprehensive urban development goals of the Buffalo Metropolitan Area. The objectives of the overall study were to develop and evaluate alternative plans comprised of both structural and nonstructural measures:

1. To protect, as fully as practicable; human health and life, property, and industry;
2. To provide improved and expanded water-related recreation opportunities;
3. To conserve and improve fish and wildlife resource;
4. To preserve, develop, beautify, and restore the quality of the water-related environment; and
5. To provide streambank stabilization and protection to prevent stream-bank erosion on specified reaches of streams in the study area.

The overall study has five parts. Four studies were previously completed and their results are discussed in the "Prior Studies, Reports, and Existing Water Projects" section of this report. The final study is presented in detail

in this report. That study consists of two separate and independent study areas, namely the Buffalo River and the Lower Tonawanda Creek. Plate 1 identifies this study area.

The Buffalo River Study focused on examining flooding related to sedimentation in the navigation channel. Based upon the effects of sedimentation in the navigation channel, the study area consisted of only 20 of the 431 square miles in the Buffalo River watershed.

The Lower Tonawanda Creek Study examined all aspects of flood management. As discussed later in this report, general lower watershed-wide examination of the water and related land resource problems and needs was completed with the exceptions of Ellicott and Bull Creeks, tributaries of Tonawanda Creek. Because flood management needs in the Ellicott Creek and Bull Creek watershed are normally independent of those in the remainder of Tonawanda Creek watershed, studies of those needs have been accomplished separately. The results of these studies are discussed in the "Prior Studies, Reports, and Existing Water Projects" section of this report.

The study area quickly narrowed in focus to the area primarily within Erie and Niagara Counties having considered the needs addressed by previous Tonawanda Creek studies and the proposed Batavia Reservoir Compound-Modified, a recommendation from the earlier Tonawanda Creek studies. The reach of lower Tonawanda Creek examined starts at Black Church Road in the town of Royalton and continues downstream to the Niagara River. This area of about 163 square miles represents the lower portion of the watershed less subwatersheds of Bull and Ellicott Creeks. That part of the lower Tonawanda Creek Watershed considered in detail during this study is shown in Plate 2.

STUDY PARTICIPATION AND COORDINATION

From the initiation of the study, two-way communication was maintained with the general public, interest groups, and local, State, and Federal officials. Coordination began in January 1987, with a letter to Congressional leaders, State officials, and local officials, stating that the Feasibility Phase of the Buffalo Metropolitan Area (Buffalo River/Lower Tonawanda Creek) Study had been initiated, and providing details of the study purpose and process.

In November 1987, a meeting was held to inform local politicians, planning, and engineering officials regarding initial scoping and data collection by the Corps and to obtain local interest input to the scoping process before proceeding into plan formulation. The coordination continued both formally and informally throughout the study through written and telephone communications.

Between September 1988 and May 1989 at least ten meetings were held, primarily with the towns of Amherst and Clarence, and the New York State Department of Environmental Conservation (NYSDEC), to discuss preliminary plan formulation. This allowed for early incorporation of local interests' concerns.

In June 1989, a public workshop was held by the Corps to obtain the broadest possible public input regarding support/non-support for plans under investigation. This meeting was announced by means of a press release and a mailing which detailed the study purpose and indicated the plans evaluated. This mailing was sent to municipal, county, regional, State, and Federal agencies and officials; public interest groups, and private citizens. An additional set of three workshops were held in June 1989, although more selective in attendance, and not all sponsored by the Corps, although the Corps was in attendance.

PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

Numerous studies and reports have been prepared concerning the water resource problems and needs in the Buffalo Metropolitan Area and the specific study areas such as the Buffalo River and Tonawanda Creek. The handling of prior studies for the Buffalo River is discussed in "The Report and Study Process" section and those for Tonawanda Creek and other watersheds are discussed here.

Five studies comprise the Corps Buffalo Metropolitan Area Study. Four of the studies address flood management in the Cayuga, Cazenovia, and Tonawanda Creek Watersheds. The fifth study identifies the practical development plan for improving recreation access and related water and land management in the Buffalo Metropolitan Area, particularly along the Niagara Riverfront. The study also addressed region-wide programs to manage wastewater, floating drift, and streambank stabilization. Other matters related to water supply, water quality, environmental quality, and fish and wildlife, were also investigated and appraised in the study. The interim report on the feasibility of comprehensive water and related land management was completed in December 1975. The full development plan recommended in the report has an estimated total first cost of about \$5,100,000 at 1975 price levels, and a benefit-cost ratio for full development of 3.5. Corps cost participation in the plan is limited to existing maintenance responsibilities for the Black Rock Channel and Tonawanda Harbor, New York, project.

A Preliminary Feasibility Study of flood management for the Cayuga Creek Watershed was completed in May 1975, and the recommended plan was well within cost limitations to qualify for completion under the Continuing Authority of Section 205 of the 1948 Flood Control Act, as amended. A Detailed Project Report was completed under this Authority in July 1979. Construction of a local flood protection project in the town of Cheektowaga, New York, was completed in December 1982 at a cost of \$1,235,200. The project consists of concrete walls, earth levees, erosion protection, ponding areas, culvert pipes with flap gates, and some minor channel improvement work all located upstream of the Union Road bridge over Cayuga Creek.

An Interim Feasibility Report on flood management alternatives for the Cazenovia Creek Watershed was completed in March 1975. The recommended plan consisted of a combination of flood plain management by local interests, participation in the National Flood Insurance Program, and the construction of an ice retention structure. The Chief of Engineers' Report was issued in September of 1977. Subsequently, in 1982, the project was continued under the Section 205 Authority. A Detailed Project Report was completed under this Authority in June 1986. The recommended plan is an ice control structure located on Cazenovia Creek about 1 mile upstream of the Union Road bridge in the town of West Seneca, New York, a suburb immediately south of Buffalo. Plans and Specifications for construction of the project are substantially complete. In December 1988, the NYSDEC, the local sponsor, requested that the project be placed in a "deferred" status until the State's fiscal situation improves and agreements can be reached with the town of West Seneca on construction cost-sharing. The project plan for Cazenovia Creek has an estimated total first cost of \$2,148,000, and a benefit-cost ratio of 1.5 based on April 1988 price levels.

A Tonawanda Creek study was authorized in 1950 and was later examined under the Buffalo Metropolitan Area Study authority, with a Final Feasibility Report completed in July 1983. The report entitled "Interim Report on Feasibility of Flood Management, Tonawanda Creek Watershed, Buffalo Metropolitan Area, New York," recommended a project consisting of two shallow detention reservoirs (normally dry) just upstream of Batavia, referred to as the Batavia Reservoir Compound-Modified (BRC-M). The recommended BRC-M project would provide approximately 500-year level of protection for the city of Batavia and variable protection downstream. The project has an estimated total first cost of \$33,200,000, and a benefit-cost ratio of 1.04 based on October 1988 price levels. The recommended project went before the Board of Engineers for Rivers and Harbors (BERH) and was eventually passed on to the Assistant Secretary of the Army for Civil Works with a recommendation that the proposed BRC-M be acted on favorably. Originally, the project was considered a regional project and the project costs were considered all Federal. Subsequently, in view of the cost-sharing requirements of the 1986 WRDA, authorization for construction of the project is subject to cost-sharing with a non-Federal sponsor. The proposed project was not included for construction authorization in the 1986 or 1988 Water Resources Development Acts. Based on the above and the fact that the local community support is divided, the potential sponsor, NYSDEC, has not indicated recent interest in the recommended project. For purposes of this latest study, the recommended BCR-M project was considered not implementable.

A summary report, summarizing the first four studies completed, of water resources and related land management for the Buffalo Metropolitan Area was completed in December 1980.

During review of the 1983 Corps' Tonawanda Creek report by BERH, the BERH staff indicated concern about the large amount of residual flood damages along the Lower Tonawanda Creek, even with the BRC-M in place. Further, the BERH staff suggested that study resolutions for Tonawanda Creek not be closed out with the processing of the Corps 1983 report, and suggested channel improvements and/or additional impoundment be investigated further.

The Corps 1983 report served to identify the flood problem along the Lower Tonawanda Creek, suggested plans of improvement in the Federal interest and identified support by non-Federal interests. Based on the above, the Corps 1983 report served as the Reconnaissance Report for this latest study of the Lower Tonawanda Creek.

Additional studies and reports were examined as a part of an exhaustive literature search done for the Lower Tonawanda Creek Study. The literature examined is not reported here or in the Supporting Documentation, but remains in the Buffalo District files in near manuscript form.

An important water project that was considered as a part of this project is the New York State Barge Canal, or as further referred to in this report, the Erie Barge Canal. Although the Erie Barge Canal existed under different configurations dating back to the 1800's, the present system was primarily complete in 1918. The Erie Barge Canal is common with the Lower Tonawanda Creek bed from the Niagara River to just west of Tonawanda Creek Road and New Road in the town of Amherst, where the canal diverges from the creek and proceeds north to the Lockport Locks, while the creek extends to the east.

Just north of the canal/creek split on the canal is the Pendleton Guard Gate. This structure allows the diversion of flows down Tonawanda Creek into the Canal. Through use of the Pendleton guard gate and other control structures, flows can be diverted out of the Tonawanda Creek Watershed. The canal is in operation usually three seasons of the year and in the winter receives only natural inflows or is dewatered. The Erie Barge Canal historically has served commercial navigation but currently the primary use is for recreational navigation. However, during the February 1985 flood on Tonawanda Creek, the guard gate at Pendleton was opened and flows allowed to fill the canal section between the guard gate and the Lockport locks then the flows cutoff. This operation was in direct response to local area flooding. No other operations of the canal to address flooding are known.

Other studies, reports, and projects in the Buffalo Metropolitan are as follows:

A flood control project on Scajaquada Creek in the town of Cheektowaga, New York, was authorized by the Senate and House Public Works Committee in December 1970, under the provisions of Section 201 of the Flood Control Act of 1965. The Phase II GDM was completed in May 1976. Construction of the project was completed in August 1981. The Federal and non-Federal first costs were \$5,065,000 and \$4,060,000, respectively.

An interim report on the comprehensive study for the establishment of harbors and harbors-of-refuge for light-draft vessels on the south shore of Lake Erie with appropriate consideration of flood problems near the mouth of Cattaraugus Creek was completed in 1966. The report was subsequently printed as House Document 97, 90th Congress, 1st Session and became the basis for construction of a dual-purpose recreation/navigation/flood damage reduction project completed in January 1983. The project provides a harbor for safe and easy navigation of small craft and refuge from lake storms. In addition, the project was intended to reduce flood damage to properties near the mouth and provide opportunity for breakwater fishing. The Federal and non-Federal first costs were \$4,797,800 and \$2,566,500, respectively.

In January 1986, the Buffalo District completed a letter report addressing ice-jam related flood problems at the mouth of Cattaraugus Creek exacerbated by the small-boat harbor project completed in January 1983. The report recommended lowering the north berm of the harbor breakwater system and a one-time ice-breaking operation at the mouth of the creek. The ice-breaking operation was not implemented due to lack of local matching funds. Lowering of the north berm was scheduled to be done in early 1988 provided that a right-of-entry was obtained from the Seneca Nation of Indians. To date, a right-of-entry has not been provided to the Corps.

A Final Feasibility Report for flood control improvements in the Cattaraugus Creek Basin was completed in December 1987. The report was a negative study termination report because of the intense and widespread opposition to construction of an ice-retention structure at Versailles, New York, to reduce damages due to ice-jam flooding at the mouth of the creek. The estimated Federal and non-Federal first costs for the ice-retention structure are \$1,086,100 and \$366,100, respectively, at October 1986 price levels.

Based on flood management studies of Ellicott Creek completed in the late 1960's and early 1970's, a flood control project on Ellicott Creek, in the towns of Amherst and Tonawanda, New York, was authorized by the 1970 Flood Control Act, the 1974 Water Resources Development Act, the FY 85 Supplemental Appropriations Act, and the 1986 Water Resources Development Act. The Phase I and Phase II GDMs were approved April 1979 and June 1983, respectively. Construction was initiated in August 1986 and completed in June 1989. The project, consisting of enlargement of existing channels and new diversion channels, has a Federal and non-Federal first costs of approximately \$11,193,000 and \$9,235,000, respectively.

In 1983 and 1984, several deaths by drowning occurred when individuals slipped or fell from the Bird Island Pier into the Niagara River. Buffalo District supervised construction of a \$3.5 million project to provide safe public access and use of the pier. The project, completed in May 1987, was cost-shared with the New York State Department of Environmental Conservation and the city of Buffalo. The project includes an elevated walkway, three refuge platforms, posts and handrailings with ring buoys, and 150 inverted corrugated metal pipe culverts to maintain water flow from the Black Rock Channel to the Niagara River.

In December 1987 the Buffalo District completed a limited Reconnaissance Study and Report on the flooding at Woodlawn, New York. No economically justified solution was found and no further investigation of flooding was undertaken.

A Final Feasibility Report on Olcott Harbor was completed by Buffalo District in November 1978. The recommended project was authorized by the 1986 Water Resources Development Act and provides for construction of breakwaters in the outer harbor, channel dredging, and recreational fishing facilities. A Draft Reevaluation Report was completed in February 1990 and recommends a modification of the authorized project. A General Design Memorandum is scheduled for completion in April 1991, Plans and Specifications in FY 92, with a construction start proposed in FY 92 and completion in FY 95. The estimated Federal and non-Federal first costs are approximately \$6,960,000 and \$6,880,000, respectively, at October 1989 price levels.

A Detailed Project Report for flood control on Bull Creek was completed by Buffalo District in February 1975 under the Section 205 Authority. There were no feasible alternatives and the Detailed Project Report was terminated for lack of a project with economic justification.

There have been numerous other studies, reports, and improvements by the Corps and others in the Buffalo Metropolitan Area including a series of Flood Plain Management Reports discussing the results of investigations of non-structural management measures.

THE REPORT AND STUDY PROCESS

Since the most recent studies of Buffalo River and the Lower Tonawanda Creek are independent, they are reported separately. Early in this essentially dual study, Buffalo River efforts were terminated and the results of that examination are summarized in a portion of the Supporting Documentation, the portion of the report which will be described later. For the remainder of the report, only the Lower Tonawanda Creek Study is reported.

This Final Feasibility Report briefly summarizes the initial or reconnaissance phase and details the study methodology and accomplishments of the feasibility phase of the two-phase planning process. Specific accomplishments through which this Feasibility Report progresses include: a summary of existing and anticipated future conditions; definition of the problems and opportunities; identification and assessment of potential solutions; assessment of the level of support and interest of non-Federal interests in the identified potential solutions; and study recommendations including the need for and Federal interest in proceeding with a project.

The planning process used a multi-objective procedure for analyzing problems and opportunities and recommending potential solutions in compliance with the Water Resources Councils Principles and Guidelines for Water and Related Land Resources Implementation Studies (10 March 1983). That process yielded this report, to be made available to the decision makers and the interested public, so that they are aware of the basic assumptions employed, the data and information analyzed, the areas of risk and uncertainty, and the significant implications of alternatives.

This Final Feasibility Report consists of a Main Report which includes an Environmental Impact Statement and Supporting Documentation. The Main Report provides a concise description of watershed characteristics, the results of the plan formulation, and the conclusions and recommendations.

The Supporting Documentation provides the detailed technical information which adds substance and support to the conclusions and recommendations of the Main Report. As previously stated, a portion of the Supporting Documentation documents the Buffalo River study. Also, the Supporting Documentation contains copies of all significant correspondence. The Supporting Documentation is bound separately.

EXISTING AND ANTICIPATED FUTURE CONDITIONS

The purpose of this section is to present an overview of study area conditions. Existing conditions and the future without project conditions are described to serve as a base case for later sections of this report where impact assessment and evaluation of any proposed solutions are described.

HUMAN ENVIRONMENT (MAN-MADE RESOURCES)

Economy/Desirable Regional/Community Growth - In the recent past, the Buffalo region was a major steel-producing region, and was for a long time the largest flour milling center in the United States.

Changes in national and regional economic growth and development has led to a virtual shutdown in steel production in the area, and a decrease in the importance of Buffalo as a flour milling center. These events for a time depressed the economy of the Buffalo Metropolitan area, raised the region's unemployment rate, and resulted in a large number of people leaving the area to find work elsewhere.

In light of the above developments, the community and region is in transition; working where possible to sustain and revitalize existing viable economic development, while pursuing all avenues of new and/or alternative means of economic development. The trend seems toward a service-type economy. The impact of transition to a service based regional economy and the dramatic economic growth in the province of Ontario have improved the economic climate of Western New York.

The U.S.-Canadian Free Trade Agreement effects are expected to made significant contributions to the regional economy, especially in Erie and Niagara Counties. Many Canadian firms, for example, have already established U.S. operations in Western New York. During the ten year phase-in of the Free Trade agreement, foreign companies can benefit from the areas two foreign trade zones. One foreign trade zone is located in Buffalo; another in Lewiston, Niagara County, New York.

Population - Table 1 represents population data for the study vicinity. About 12,000 people reside within the 100-year flood plain.

Land Use and Development - The town of Amherst is an extensively developed residential community in the northern portion of Erie County, New York. The town of Clarence, to the east of the town of Amherst, is more rural. The major north-south arterial - Transit Road - divides the two towns. The northern border of these two towns is Tonawanda Creek. The northern parts of these towns are lesser developed than the remainder of these towns for the most part, and generally coincide with the Tonawanda Creek flood plain. The urban and commercial development within the flood plain in these towns is primarily in the Ransom Oaks subdivision in Amherst, along Transit Road and along the the several roads within the Tonawanda Creek watershed in Clarence. Agriculture in the flood plain generally corresponds with the Agricultural District which runs from about Transit Road east along the northern portion of Clarence.

Table 1 - Population Change

Area	1980	1990		2000		2010	
Erie County	1,015,472	983,773	-	987,749	+	984,665	-
(Buffalo, PMSA)							
Niagara County	227,354	217,257	-	221,589	+	223,962	+
Amherst (T)	108,706	119,550	+	132,150	+	131,750	-
Clarence (T)	18,146	18,250	+	19,100	+	19,050	-
Lockport (T)	12,942	13,650	+	15,600	+	15,800	+
Pendleton (T)	4,726	4,750	+	5,000	+	5,050	+

SOURCE: Population Projections 1985, NYS Department of Commerce, NYS Department of Environmental Conservation.

North of Tonawanda Creek is Niagara County and the towns of Pendleton and Lockport. With the exception of the vicinity of North Tonawanda Creek Road along Tonawanda Creek the portion of these towns within the flood plain is undeveloped or in agriculture.

Flood Plain Description - The 100-year flood plain for Tonawanda Creek within the study area can be sub-divided into two areas. One area is along the mainstem Tonawanda Creek from the Erie Barge Canal to the hamlet of Rapids where flooding is contained between the roads along both sides of the creek. The second area is the extensive flood plain in the subwatersheds of Ransom-Black Creeks where the flood plain generally extends a mile or more on either side of the creeks. The 100-year flood plain is shown on Plate 3. The development within the flood plain is described above.

Flood Plain Management - The towns of Pendleton, Lockport, Amherst, and Clarence participate in the regular program of the National Flood Insurance Program administered by the Federal Emergency Management Agency. Flood insurance and flood plain management maps have been developed and local ordinances pertaining to new development or redevelopment in the flood plain (100-year) and flood protection to the intermediate regional or 100-year flood level have been enacted. Flood insurance helps to compensate residents for flood damages to existing developments, while flood plain development ordinances reduce the potential of flood damage of any future developments or redevelopments.

Business and Industry/Employment and Income - Much of the regional economy is devoted to agricultural activity including dairy, field crop, and fruit production. The industrial economy of Western New York was built on shipping, grain, steel, transportation, metallurgy, and hydroelectric power for a diversity of manufacturing operations. Buffalo was a major shipping, steel, and petroleum refining center and is still an important grain, automotive, and industrial center. The economy is shifting, however, from heavy manufacturing, to a more business finance, and service orientation. Buffalo is also an important center for research with about 150 research laboratories in the area.

During the 1983-1987 period, the Buffalo-Niagara Falls Consolidated Metropolitan Statistical Area (CMSA) which includes the Buffalo Primary Metropolitan Statistical Area (PMSA) and the Niagara Falls PMSA, experienced one of the sharpest expansions on record. The five year expansion has largely occurred in the service sector. The economic expansion has also helped to reverse the continued out flow of the region's young workers and slow down the area's population decline. The area's smaller labor force is now experiencing selected labor shortages. The CMSA unemployment rate during 1987, for example, dropped below the national rate for the first time since the series began in 1974. As Western New York continues to reflect the national trend of an older population, a large number of employment opportunities will arise from retirements. Over 100,000 job openings are expected annually in Western New York during the short term; approximately 95 percent of the openings are attributed to separations from the labor force and occupational mobility.

Employment declined from 1979-1983 in the Buffalo-Niagara Falls area and then showed a resurgence from 1983-1987, see Table 2. The growth in employment can be credited to the services sector. The services sector increased approximately 27 percent, from 100,800 in 1980 to 127,900 in 1987.

Table 2 - Total Area Employment (Thousands)

Area	1978	1979	1980	1982	1983	1984	1986	1987
Buffalo-Niagara Falls	522.8	538.7	521.2	474.7	473.2	479.0	492.8	508.0
Erie County	428.6	440.9	426.5	387.9	386.7	400.3	407.2	420.2
Niagara County	94.2	97.8	94.6	86.8	86.6	78.7	85.6	87.7

SOURCE: New York State Business Fact Book, 1988, 1985, 1984, 1981, 1979 - New York State Department of Commerce.

Employment figures by type of industry for the Buffalo-Niagara Falls CMSA in selected historical years from 1980-1989 are shown in Table 3. Aside from the services sector, the Buffalo-Niagara Falls area is experiencing employment growth in the wholesale, retail trade and finance, insurance, and real estate sectors.

Table 3 - Employment By Type Of Industry In Buffalo-Niagara Falls CMSA

Industry	Buffalo - Niagara Falls CMSA			
	(1980)	(1986)	(1987)	(1989)1/
TOTAL	503,400	501,600	515,800	535,500
Contract Construction	16,900	18,300	20,100	20,600
Transp., Public Utilities	27,300	25,000	25,200	25,300
Wholesale, Retail Trade	113,600	123,900	127,400	132,200
Finance, Ins., Real Estate	22,400	26,400	28,200	31,000
Services, Mining, Misc.	100,800	122,500	127,900	136,600
Government	88,000	84,600	86,100	88,700
Manufacturing	134,400	100,900	100,900	101,100
Durable Goods	(89,300)	(64,500)	(63,200)	(63,400)
Nondurable Goods	(45,100)	(36,400)	(37,700)	(37,700)

SOURCES: 1980 Census of Population, Characteristics of People and Housing prepared by the New York State Data Center and New York State Business Fact Book, 1981, 1986 NYS Dept. of Commerce.

1/ Second Quarter, 1989. State of New York Department of Labor, Labor Area Summary.

In the study area, considerable employment opportunities are the result of State University of New York at Buffalo's North Campus which is located just to the southwest of the study area. The University is a major research facility with the distinction of being the National Earthquake Research Center. Employment opportunities in support of the University and secondary industries have greatly increased in the area. Also, additional development and growth has been in the retail/commercial development along Transit Road, although more so slightly north and south of the study area.

Erie County's per capita income has grown at an average annual growth rate of 7.65 percent from 1978 to 1986. Niagara County's per capita income grew at a 7.3 percent average annual growth rate from 7,700 in 1978 to 13,516 in 1986. Table 4 presents the per capita income for Erie and Niagara Counties for the period 1978-1986.

Table 4 Per Capita Income For Erie And Niagara Counties (1978-1986)

County	1978	1979	1980	1981	1982	1983	1984	1985	1986
Erie	8,021	8,901	9,865	10,777	11,285	11,916	12,971	13,680	14,469
Niagara	7,700	8,629	9,450	10,277	10,812	11,259	12,301	13,003	13,516

SOURCE: 1987-1988 New York State Statistical Yearbook, Table F-17, pg. 17. Nelson A. Rockefeller Institute of Government

Public Facilities and Services - Utilities which service the community include water, sewer, electric, gas, and telephone. A major gas pipeline and brine pipeline pass through the study area.

Police and Fire Protection is provided by town police. These protection services are also supplemented by County Sheriff's Departments and the New York State Police. Similarly, the study area is serviced by town fire departments. Generally, existing services are considered good.

For transportation, the study area has an adequate network of highway facilities. Major roadways which service the immediate project area include Millersport Highway, Transit Road, and Route I-990, which is under construction and will soon cross Ransom Creek and connect to Millersport Highway. The lower portion of Tonawanda Creek is also a transportation corridor serving as part of the Erie Barge Canal, which provides for primarily recreational navigation.

Property Value and Tax Revenues - The average value of farmland (land and buildings) for Erie and Niagara Counties is roughly estimated at \$2,000 per acre. An average median value of homes (house and lot) in Erie and Niagara Counties is roughly estimated at \$85,800. Amherst and Clarence are major development areas for the Buffalo Metropolitan area. Land and property values in these areas are multi-increased over average values accordingly. Local tax revenues generally include revenue sharing (Federal, State, local), and local property, service district, and sales taxes.

Noise and Aesthetics - No significant adverse noise problems or sources were noted in the immediate project study area. The major source of noise is from the movement of vehicular traffic along the major thoroughfares. The creek area is generally aesthetically pleasing. The stream banks contain mature trees and vegetation. Most shoreline residences are in relatively close proximity to the creek and are generally well kept. Upland areas are generally a mix of open, wooded, agricultural, or sub-division housing developments. Commercial areas are generally concentrated along major thoroughfares.

Community Cohesion - Developments in the primary project impact area (primarily Amherst and Clarence) are both old and new. Development pressure in this area is high. Concerns associated with development is not uncommon. Issues dealing with development and open spaces are expected to increase. To date, the State and local interests are supportive or investigations of potential flood damage reduction measures. Ideas on problems and solutions however, are not always consistent.

Cultural Resources - A cultural resources survey was conducted for portions of the study area. Several areas of potential cultural resources significance were identified.

NATURAL ENVIRONMENT (NATURAL RESOURCES)

Air Quality - Based on information provided in the Compilation of Codes, Rules, and Regulations of the State of New York, Chapter III Air Resources, Title 9, Part 276 indicates that, the project study area in the town of Amherst lies within an area designated as having an air quality level classification of Level III, whereas the project study area in the town of Clarence lies within an area designated as being Level II. Land uses associated with the Level II classification contain predominantly single and two family residences, small farms, and limited commercial services and industrial development. Land uses associated with the Level III air quality classification contain densely populated, primarily commercial office buildings, department stores, and light industries in small and medium metropolitan complexes, or suburban areas of limited commercial and industrial development near large metropolitan complexes.

Water Quality - Based on best usage of waters, the following are the current NYSDEC existing water quality classifications for creeks in the general vicinity of the project study area: Erie Barge Canal - classified as "C"; Tonawanda Creek from the junction of the Erie Barge Canal, upstream to about the Genesee County line - classified as "B"; Ransom Creek from the Barge Canal upstream to its junction with Got Creek - classified as "C" (the remainder of Ransom Creek is classified as "Ct"); and Black Creek is classified as "D". In general, best usage for each of the aforementioned NYSDEC water quality classifications are described as follows: Waters classified as "B" may be best used for bathing and any other usages except as a source of water supply for drinking, culinary or food processing purposes. Waters classified as "C" may best be used for fishing and other usages except for bathing or as a source of water supply for drinking, culinary or food processing purposes. A "Ct" classification indicates the waters contain or are capable of containing trout, whereas, waters classified as "D" are considered suitable for secondary recreation, but due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery or streambed conditions, the waters will not support the propagation of fish.

Benthos - In general, low numbers and diversity of benthic invertebrates were obtained at all sampling stations on Tonawanda, Black, and Ransom Creeks during a 1988 USF&WS biological survey.

Fisheries - The mainstem of Tonawanda Creek and its associated tributaries in the potential project area provide aquatic habitat for a variety of warmwater game and non-game fish species. NYSDEC regards Tonawanda Creek as being a valuable natural resource in Western New York and Ransom Creek as valuable habitat for fish.

In order to obtain some current information about fish species inhabiting Tonawanda Creek, Ransom Creek, and Black Creek in the general locale of the potential project area, a biological field sampling was performed on these waterways in 1988.

During the field sampling survey on Tonawanda Creek, the fish species taken generally represented warmwater streams that are less than high quality. On Ransom Creek, the species collected again represented fishes that are relatively tolerant of siltation and turbidity. On Black Creek, warmwater fish species were also present, which included game and non-game species as well as forage fish (predominantly mud minnows). Capture of a juvenile northern pike and presence of an adult northern pike carcass on the bank of Black Creek, suggests that spawning activity for this species probably occurs in the upper reaches of this creek.

Wildlife - The habitat ranges from farmland that is newly cultivated to crop fields in grain, hay or some truck crops (vegetables), to early-mid- and late successional fields containing grasses, legumes, forbs, shrubs, and young trees interspersed with hedgerows. Other habitat types found are terrestrial hardwood woodlands, some seasonally flooded palustrine wooded areas (classified as wetlands by NYSDEC) and also, vegetated riparian zones established with mixtures of herbaceous plants, vines, overhanging trees, and shrubs adjoining the watercourse corridors of Tonawanda Creek and its associated tributaries. Openland, woodland, and wetland wildlife species are attracted to this diversity of habitat. Avian, mammalian, reptilian, and amphibian wildlife that utilize the potential project area - seasonally and/or year-round - are generally representative of similar areas in Western New York.

Vegetation - Banks along waterways and terrestrial areas in the general project locale contain a rich variety of woody and herbaceous vegetation ranging from tall hardwood trees, to an understory of young tolerant and intolerant hardwood trees, shrubs, vines, forbs, and grasses.

The steep banks, deep water, and turbidity associated with much of Tonawanda Creek, particularly between its juncture with the Erie Barge Canal upstream to about Rapids Road in the town of Clarence, apparently provides poor habitat for establishment of aquatic plants. Few to no aquatic macrophytes (submergent, floating, or emergent) were observed in this stretch of waterway during the field biological study conducted for this study. The majority of aquatic macrophytes were encountered, either to some degree or commonly, in or along the shallower and narrower tributaries of Ransom and Black Creeks.

Wetlands - There are a number of wetlands in the study area. Some of the wetlands are seasonally flooded and subject to a high water table.

Threatened and Endangered Species - No Federally listed or proposed endangered or threatened species are known to exist in the study area. However, the longear sunfish (Lepomis megalotis) which is listed as a "threatened" species by NYSDEC, and a number of shellfish species ranked as rare by the New York Natural Heritage Program, along with a fish species, the brindled malton (Noturus miurus), have been found in various parts of Tonawanda Creek.

PROBLEM AND OPPORTUNITIES IDENTIFICATION

The purpose of this section is to inform the reader of water and related land resource problems, needs, and opportunities with the emphasis on those dealing directly with flood damage reduction. At the same time, those needs are described which may be considered secondary to flood damage reduction, yet which may be addressed as a part of any potential solution for flood damage reduction.

PROBLEMS, NEEDS, AND OPPORTUNITIES

The major water resource problems of the lower Tonawanda Creek are addressed here with the needs quantified to the extent possible and a determination made of what opportunities exist to address the needs and relieve the problems.

Historical Flooding - Flooding has frequently caused widespread damage to the lower Tonawanda Creek watershed. According to records most of the floods have been caused by melting snow with moderate amounts of rainfall, rather than by rain alone. Although damaging floods may occur at any time of the year, and occur practically every year, almost all instances of major flooding have occurred in late winter or early spring. However, summer floods of 1902 and 1903 occurred just before the harvesting season and were disastrous to agricultural interests.

Flooding in the Tonawanda Creek watershed has been recorded as early as March 1865. Historical information indicates that the largest floods occurred during March 1865 and March 1904. However, these floods were aggravated by a dam that has since been removed.

The greatest flood of recent years occurred during the month of February 1985. Although other floods have exceeded or equal the February 1985 flood (1940 and 1960), the 1985 flood caused more damage due to large increases in residential and commercial development in the town of Amherst and Clarence since 1960. The 1985 flood is considered to have a return interval of 25 years, and is often referred to as a 25-year event.

Flooding has been negligible below the confluence of Tonawanda Creek and the Erie Barge Canal. Maintenance of channel depths and widths for waterborne barge traffic and recreational navigation have provided sufficient capacity for most past floods. From this confluence to a point about two miles upstream of the hamlet of Rapids, flooding has been generally limited to overflow at channel bends, with the inundated area generally staying within the roads bounding the creek, and having a maximum width of about 1,000 feet. From Rapids to Hopkins Road near the Tonawanda Indian Reservation, Tonawanda Creek annually inundates vast areas on both sides of its channel. In several areas, floodwaters have flowed across natural watershed divides into the Mud, Ransom, and Black Creek subwatersheds. In these areas, the flood plain width is as great as four miles. The two prominent areas of overflow occur near Alabama and at Beeman Creek. Downstream of Alabama during such events, Tonawanda Creek overflows its banks and enters the Mud Creek Watershed. Overflow from Tonawanda Creek to Mud Creek Watershed has occurred frequently just downstream

of Alabama. In 1960 the Mud Creek flood plain varied from 500 feet to 8,000 feet in width from a point just downstream of Hopkins Road to a point north of the hamlet of Rapids. At Beeman Creek, Tonawanda Creek backs up Beeman Creek, then overflows Salt Road into the Black-Ransom Creek subwatershed. When this occurred in 1960, the Ransom and Black Creek flood plains were approximately 8,000 feet in width from Salt Road downstream to a point just upstream of the confluence of Ransom and Tonawanda Creeks. Because of the very flat topography and the expansive flood plains, the flood depths are usually not significant nor flood velocities high. Also, the flood events can often take two or more days to peak with several additional days until conditions return to normal. The exist conditions 100-year flood outline is shown on Plate 3.

Floods of the same or larger magnitude than those that have previously occurred could also happen in the future. Larger floods have been experienced in the past on streams with characteristics similar to those in the study area. Combinations of rainfall and snow melt that produce those large floods are likely to occur over the Tonawanda Creek Watershed, causing flooding. As was previously stated, the most recent substantial flood was a 25-year event and there is a considerable probability that a 25-year flood will be equaled or exceeded. There is an 87 percent chance that a flood similar to the February 1985 flood would occur within the 50 year project life of a proposed project, and there is a 40 percent chance that a 100-year flood will occur within the 50 year project life of a proposed project.

Urban Flood Damages - Urban flood damages experienced along the Lower Tonawanda Creek fall into three categories: residential, commercial, and public and other. As a part of this study, urban flood damages as identified in the Corps 1983 report on Tonawanda Creek were first examined. There are primarily two major Lower Tonawanda Creek flooding problems, one of water spilling into Mud Creek; and water spilling into Ransom-Black Creek. However, only the Ransom-Black Creek problem was found significant even considering levels of development in 1989. The remaining discussion of Urban Flood Damages thus focuses on Ransom-Black Creek subwatershed and the mainstem Tonawanda Creek itself.

Residential damages which consider the structure and its contents were found to be concentrated in the Ransom Oaks subdivision within the town of Amherst, with the greatest part of the remainder primarily within the town of Clarence.

Commercial damages, which consider the structure and its contents, were not found to be very significant with the greatest concentration along Transit Road.

Public and other damages include damages to streets, water and sewer systems, recreational facilities, and other unique damages generally associated with public facilities. Public and other damages were found to be concentrated in Clarence.

Agricultural Damages - With recurrent flooding, farmers are unable to make full and productive use of fertile soil within the flood plain. Most flooding occurs during early spring, and can delay plantings or ruin initial plantings. Because of the flood risk some fields may not be planted. Also, if the flood risk were reduced agricultural production may change to a different more intense usage.

Other Flood Costs - Other flood costs include flood fighting and detour costs. Flood fighting costs are those nonrecurring public expenditures involved in flood fighting, evacuation, and police protection. Special services have been provided by police and firemen in the past, although specifics, including costs, are not thoroughly documented. Detour costs are the costs associated with additional delay times and transportation costs due to rerouting of traffic around flooded roads. Major roads subject to closure, include Millersport Highway and Transit Road, however, annualized detour costs avoided are insignificant.

There are also additional costs associated with current and potential residential housing in the floodplain. These costs include administrative costs of the flood insurance program, additional landfill costs required for new construction, and additional construction costs related to floodproofing.

Expected Annual Damages - Expected annual damage (EAD) is defined as the frequency-weighted sum of damage for the full range of possible damaging flood events and can be viewed as what might be expected to occur in the present or any future year. It represents the annual damage resulting from a particular set of hydrologic, hydraulic, and damage conditions. The Lower Tonawanda Creek Watershed study area was broken up into reaches as shown on Plate 4. The EAD derived for conditions without a project are shown in Table 5.

Table 5 - Expected Annual Damages (Without Project Conditions)

Reach	Urban Inundation Damages	Agricultural Inundation Damages	Total Existing	
			Total Average Annual Urban & Agricultural Inundation Damages	
	\$	\$	\$	
T1	104,000	0	104,000	
T2	185,600	0	185,600	
T3	41,600	1,800	43,400	
T4	62,500	1,700	64,200	
T5	82,800	9,200	92,000	
T6	1,100	68,800	69,900	
Total T's	477,600	81,500	559,100	
RB1	107,200	700	107,900	
RB2	619,300	17,100	636,400	
RB3	176,800	51,900	228,700	
RB4	52,800	6,500	59,300	
Total RB's	956,100	76,200	1,032,300	
Total	1,433,700	157,700	1,591,400	

NOTE: All damages are average annual values and reflect July 1987 prices, a 50-year project life, and an 8.875 percent annual interest rate.

NATIONAL OBJECTIVE

Current Federal Policy, as developed by the President's Water Resources Council, requires that water and related land resource plans be formulated in ways that contribute to the National/Federal objective. As defined, "The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements."

Contributions to national economic development (NED) are the direct net benefits that occur in the Lower Tonawanda Creek Watershed and the rest of the Nation. The plan that maximizes contributions to NED is sought out as a part of the planning process and is designated the NED plan.

SPECIFIC PLANNING OBJECTIVES

Specific planning objectives are the National, State, and local water and related land resources management needs specific to the Lower Tonawanda Creek study area that can be addressed to enhance National Economic Development. Based on a review of the authorizing Legislation for the study, previous reports for the area, statements by individuals in the private sector, input from officials at many levels of government, and an analysis of the problems and needs of the study area, the specific planning objectives for this Feasibility Phase Study have been identified as follows:

Provide for flood damage reduction within the existing floodprone urban and agricultural areas of the study area to enhance NED;

Reduce the flood potential within the study area to improve the safety and health of the study area community;

Reduce the flood potential on productive soils in the study area to increase agricultural production;

Minimize the alteration of the natural environment of the study area in order to preserve the fish and wildlife species which currently abide there;

Preserve unique cultural resources in the study area to protect local and National cultural heritage; and

Encourage future land use practices consistent with National flood plain management policies to prevent future losses from use of the flood plain.

PLANNING CONSTRAINTS

The lower portion of Tonawanda Creek, from the Niagara River to just upstream of Ransom Creek, serves as a portion of the Erie Barge Canal. The Erie Barge Canal is used for commercial navigation, yet it is

primarily used for recreational navigation. This study was constrained to the extent that plans for flood control must be compatible with navigation on the lower reaches of Tonawanda Creek.

Tonawanda Creek is a tributary of the Niagara River which is a boundary water and subject to treaties with Canada and the jurisdiction of the International Joint Commission (IJC). Plans evaluated were constrained by terms of the Treaty of 1950 applicable to the Niagara River and its tributaries and the terms laid down by the International Niagara Board of Control of the IJC, formed pursuant to the Boundary Waters Treaty of 1909.

PLAN FORMULATION

The purpose of this section is to provide a summary of the plan formulation effort conducted for this study. The section provides: a discussion of the rationale/methodology used, a brief review of alternative plans in previous studies, formulation and evaluation criteria considered, a discussion of management measures, and a description of plans developed.

PLAN FORMULATION RATIONALE

The "planning process" is an investigation which is designed to effectively and efficiently solve a particular water and land-related resource problem in an identified area given a set of objectives and constraints.

Cursory consideration is given to measures which may address the problems and needs, once even preliminary definition of the problems and needs are established. However, the planning process is iterative, and, as initial study emphasis shifts from the problems and needs as they become further defined, the shift is to plan formulation and consideration of plans. Then, as plan formulation takes precedent, formulation and evaluation criteria are derived, always keeping in mind the planning objectives and measures, and plans/alternatives are derived.

Plan formulation is the process whereby all reasonable alternative plans are identified, developed, evaluated, and compared. Impractical and unfeasible alternative plans were eliminated through the planning process, and those plans remaining became more refined through additional development and subsequent iterations. After all iterations have been performed, a recommendation as to the "best" solution is made. That recommendation is the basis for authorization of a project in the case of a favorable report.

In general, alternative plans identified as potential solutions come from: previous studies; plans identified by the public; experience with similar water and land-related resource problems; and those required by law or regulation.

ALTERNATIVES ADDRESSED IN PREVIOUS STUDIES

Extensive studies of Tonawanda Creek primarily related to flood damage prevention have been performed by the U.S. Army Corps of Engineers. The focus of this study is flood damage prevention, so any prior studies which addressed that problem were scrutinized.

The most recent study of Flooding was by the U.S. Army Corps of Engineers in 1983. The plans of improvement considered for the Tonawanda Creek Watershed included nonstructural measures, structural - local protection measures; and structural - regional protection measures. The study recommended a project that would be located on Tonawanda Creek, just upstream of the city of Batavia, New York, in the Buffalo Metropolitan Area. The recommended project, Batavia Reservoir Compound-Modified (BRC-M), consists of two low earth dams in tandem, each with its own outlet works and emergency spillway, and four training dikes.

Snags and debris jams would be removed in the upper and lower reservoir areas. The project would reduce average annual damages in the city of Batavia by 96 percent with lesser percentages downstream of the city.

During initial phases of the present study of the Lower Tonawanda Creek, because of the uncertainty of implementation of the BRC-M plan, all plans were to be evaluated for both with and without BRC-M conditions. NYSDEC, the potential local sponsor, later dropped any support of the BRC-M, negating the need to consider the BRC-M.

Two other plans, namely the Alabama Reservoir and Clarence-Amherst Division, considered in the U.S. Army Corps of Engineers 1983 study, yet eliminated during preliminary screening, were examined as part of the present study. For the previous study, the Alabama Reservoir was dropped because it would have provided no protection to the city of Batavia, and would have had significant negative environmental impacts. For the previous study, the Clarence-Amherst Diversion would have done little to solve the regional flooding problem and would have had some negative environmental impacts. Therefore, it was dropped from further consideration.

During the present study, a cursory review of the Alabama Reservoir found it hydrologically inadequate as a flood control reservoir and identified similar environmental concerns as in past studies, such as the storage area is a wildlife refuge, thus eliminating it from further consideration. A similar cursory review of the Clarence-Amherst Diversion found that the plan, with variation, had more potential for alleviating the regional flooding of the Lower Tonawanda Creek. Variations of that plan were examined further as described later in this report.

FORMULATION AND EVALUATION CRITERIA

Federal policy on multiobjective planning, derived from both legislative and executive authorities, establishes and defines the national objective for water resources planning, specifies the range of impacts that must be assessed, and sets forth the conditions and criteria which must be applied when evaluating plans. Plans were formulated and evaluated to address the national objective and specific planning objectives stated earlier for this study.

The planning framework used by this study is in the Water Resources Council's "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies." The process requires that the impacts of a proposed action be measured and the results displayed or accounted for in terms of contributions to four accounts: National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (SE). The formulation process must be conducted without bias as to structural and nonstructural measures.

Within the structure of the overall planning framework, other more specific criteria relative to general policies, technical engineering, economic principles, social and environmental values, and local conditions must be established. These criteria, noted as "Technical," "Economic," "Socioeconomic and Environmental," and "Other" are as follows:

Technical Criteria

- ° For each of the levee plans include a minimum 10-foot top width to provide for maintenance access, and 3-feet of freeboard.
- ° For each plan developed, floods which exceed plan design flood levels should not cause catastrophic damages.
- ° Plan design and expected operations and maintenance should reflect the physical plant and ability of local communities to operate and maintain the project.

Economic Criteria

- ° Tangible benefits should exceed project economic costs.
- ° Each separable unit of improvement or purpose should provide benefits at least equal to its cost unless justifiable on a non-economic basis.
- ° Each plan, as ultimately formulated, should provide the maximum net benefits possible within the formulation framework.
- ° The costs for alternative plans of development should be based on layouts, estimates of quantities, and comparable unit prices.
- ° The benefits and costs should be in comparable economic terms to the fullest extent possible.

° A 50-year economic life and 8-7/8 percent interest rate are used for the economic evaluation of local protection plans.

° The project evaluation period for protection plans is a 50-year interval beyond the estimated implementation date.

° The base case for comparison of alternative plans is a condition that is expected to exist without any Federal action or the "no action" plan.

° For levee plans, the entire 3-feet of freeboard should be considered in the project cost, while one-half of the freeboard, or 1.5 feet, should be considered to provide flood control benefits.

Socioeconomic and Environmental Criteria

The criteria for socioeconomic and environmental considerations in water resources planning are prescribed by the National Environmental Policy Act of 1969 (PL 91-190) and Section 122 of the River and Harbor Act of 1970 (PL 91-611). These criteria prescribe that all significant adverse and beneficial economic, social and environmental effects of planned developments be considered and evaluated during plan formulation. Mitigation will be used to the extent practicable.

Other Criteria

1. Cost Sharing - Project cost-sharing and financing, as specified in the Water Resources Development Act of 1986 (PL 99-662), is as follows:

Flood Control (Structural) - Federal responsibilities include up to a maximum of 75 percent of the cost of the flood control project. Non-Federal interests are required to: pay 5 percent of the cost of the project during construction; provide all lands, easements, rights-of-way, and dredged material disposal areas; relocate all utilities; pay an additional amount during construction such that the total contribution of the non-Federal sponsor is equal to 25 percent of the cost of the project, if required; and operate and maintain the completed project. However, in no instance shall the non-Federal share exceed 50 percent of the cost of the project.

Flood Control (Nonstructural) - Federal responsibilities include 75 percent of the cost of the project. Non-Federal interests are required to provide all lands, easements, rights-of-way, and dredged material disposal areas; and relocate all utilities up to a maximum of 25 percent of the cost of the project; pay an additional amount during construction such that the total contribution of the non-Federal sponsor is equal to 25 percent of the cost of the project, if required; and operate and maintain the project.

Add-On Recreation - Federal responsibilities include 50 percent of the construction cost of separable project features. Non-Federal interests are responsible for providing 50 percent of the cost of separable project features; and operating and maintaining the separable project features. Cost-sharing for the joint project features are as specified above.

2. Local Sponsor - Formal assurances of local cooperation must be furnished by a municipality or other public agency fully authorized under State law to give such assurances and financially capable of fulfilling all items of local cooperation. The New York State Department of Environmental Conservation is the designated local sponsor for Corps-built flood control projects in New York State.

3. Financial - The financing options for any plan be considered.

MANAGEMENT MEASURES

Measures are broad spectrum type solutions for flood damage reduction. Measures do not have any dimensions or specifics but measures are the basis of plans which have specifics such as size, shape, specific location, etc. Measures were first evaluated before development of specific plans.

Measures considered for flood management along Lower Tonawanda Creek are of two different kinds, nonstructural and structural. The two kinds are not necessarily different in physical character, as their names imply, but rather are different in function. Nonstructural measures protect against flood damage at specific sites but do not manage the flooding itself. Conversely, structural measures protect against flood damage by altering the characteristics of flooding.

Several nonstructural and structural measures are discussed in this Section of this report. This initial part of a screening process is to develop, identify, and select the most suitable, feasible, and appropriate measure to satisfy the Planning Objectives and evaluation criteria stated earlier in this report. The measure should have reasonable social acceptance for implementation.

Nonstructural Measures

Nonstructural measures for use in flood management have two general functions: to protect against flood-related losses at individual sites, and to reduce overall need for flood protection. Flood warning and emergency action, floodproofing, and flood insurance are designed to partially protect against flooding at individual sites of possible flood damage. Flood plain management and permanent evacuation reduce need for flood protection by regulating flood-damageable uses, but provide no protection for existing development.

1. Flood Warning and Emergency Action.

Flood warning measures provide information about possible flooding so that those who might be affected by such flooding can escape with some belongings, or can employ emergency measures, such as sandbags, to protect themselves.

Normally, a storm which has potential to produce high creek levels approaches slowly enough so that there are several hours or even days for warning. Currently the National Weather Service issues Flood Warning statements and the Lower Tonawanda Creek is within the range of weather band radio transmissions to receive these alert signals. Also, local radio and television stations often issue weather bulletins regularly during normal broadcasts when there is a threat of high creek levels.

It is viewed that flood warning is sufficient and that any specific system for the Lower Tonawanda Creek would only be needed as a part of a more precise operation plan requiring other measures.

2. Floodproofing.

Floodproofing measures, both temporary and permanent, provide onsite protection of individual properties against flood-related damages. Temporary measures include closure devices and barricades. Permanent measures include watertight substructures, building anchors, pedestal foundations, and individual dikes, levees, and floodwalls. Floodproofing should only be considered on a voluntary basis. Condemnation is not considered practicable.

3. Flood Insurance.

Flood insurance provides some financial protection to victims of flood-related property losses, but does nothing to prevent such losses.

The towns within the Lower Tonawanda Creek Watershed participate in the regular program of the National Flood Insurance Program administered by the Federal Emergency Management Agency. With the current ability to utilize insurance and sufficient flood plain ordinances to reduce the potential of flood damage to any future developments or redevelopment, this measure was not considered further.

4. Flood Plain Management (Land Use Regulation).

Flood plain management measures regulate land use to prevent or reduce future flood-damageable development in flood plains. Flood plain management does not address the problem of damageable structures already in the flood plain.

Besides the provision for insurance, one intent of the National Flood Insurance Program is to encourage communities to adopt effective flood plain management regulations. By means of zoning laws, building codes, and subdivision regulations, a flood plain management program would prevent highly damageable uses of floodlands, while permitting less susceptible uses such as farming and recreation.

Based on requirements of the National Flood Insurance Program, the towns within the Lower Tonawanda Creek Watershed have established flood plain management regulations and flood insurance zones based on a 100-year frequency of flooding. Therefore, this measure was not considered further.

5. Permanent Evacuation.

Permanent evacuation measures result in the removal of existing flood-damageable structures from flood susceptible lands and thereby eliminate to some degree the need for flood damage management.

Based solely on the high cost of this measure, even to evacuate one residence this measure was not considered further based on the relative significance of potential benefits.

6. Operation of Existing Water Projects.

The Erie Barge Canal was examined for potential usage as a means to divert high flows out of the Tonawanda Creek Watershed. The Erie Barge Canal had been used during the February 1985 flood to accept water to the extent of filling the normally dewatered prism from the Pendelton Guard Gate to the Lockport Locks. Based on coordination with the New York State Department of Transportation, use of the Barge Canal for flood control may be a compatible use and this measure was examined further.

Structural Measures

There are two basic kinds of structural measures for flood management: local protection and regional protection measures. Local protection measures protect properties only in their immediate vicinities. Regional measures protect, to some degree, all properties often well beyond their immediate vicinity.

1. Levees.

Levees generally function to protect by providing an impermeable barrier higher than the design water level. Levees were considered as functionally addressing the flooding problem. First, levees were examined as the sole means of containing the Tonawanda Creek overflow. Levees at the unstream end in an area of rather flat topography had to go excessive distances to tie to high ground. The use of levees would result in loss of storage and would require high levees in the downstream reaches including into the Tonawanda's, where extensive development is present and significant relocation problems would be anticipated. Again, along Ransom-Black Creek difficulties in tying to high ground were found. On the basis of the above an entire levee scheme was found infeasible. The raising of Salt Road to serve as a levee and prevent Tonawanda Creek waters from entering Ransom-Black Creek subwatershed, was also found infeasible. With the raising of Salt Road, all flow would be forced into the existing Tonawanda Creek where there wasn't sufficient capacity.

Levees were also examined in combination with channelization along Ransom Creek, however, tying to high ground with necessary freeboard was found impracticable and not examined further.

Levee use was limited, primarily by the relatively flat terrain and excessive distances needed to tie to high ground. Levee use is described further with specific plans.

2. Floodwalls.

Floodwalls function as levees; however, they perform the same function using lesser area and cost more. Since floodwalls generally are more costly, consideration of floodwalls was not carried forward.

3. Diversion.

Diversions are used to convey water away from the floodprone site. Two methods of diversion were considered here. One method carried forward from previous studies, was to divert waters from Tonawanda Creek upstream of the damage area back to the creek downstream of the damage area. This method was not considered feasible because of the loss of flood plain storage which would result in increase flows/stages downstream. This was similar to the Clarence-Amherst diversion and was not considered further.

Diversion could also include collecting Tonawanda Creek waters which had already overtopped banks and diverting those waters back into the creek. This type of diversion was considered further.

4. Channelization.

Channelization is the improvement of existing channels in width or depth to allow for additional flow capacity. Channelization can also reduce the thalweg distance or straighten out meanders in a natural channel. The net result of channelization is to convey flows downstream quicker while reducing flood plain storage and often channel storage.

Channelization of Tonawanda Creek was considered but limited by: design considerations associated with unstable soils which would require excessive work to stabilize the bank; available room to increase channel capacity to meaningful capacity without relocations; and potential environmental impacts of converting a natural creek to a man-made channel.

Channelization of all of Black Creek, as proposed by some publics, was not considered feasible. The existing channel capacity of Black Creek is so small that channelization would essentially be as costly as constructing a new channel while at the same time eliminating the natural channel.

Limited channelization was examined further as is discussed in various plans.

5. Covered Channel or Closed Conduit.

Covered channel and closed conduit are used to convey flow essentially like open channels; however, the flow is contained for the given capacity. Flooding is shifted upstream to the inflow point on the channel or conduit when capacity is not sufficient for all inflows. The costs of covered channel or closed channel was prohibitively high in cost versus an open channel and therefore not considered further.

6. Clearing and Snagging.

Clearing and snagging is the removal of dense brush, loose material, and fallen trees to allow for additional flow capacity by reducing the channel roughness. This measure was investigated further.

7. Pumps.

Pumps are used to raise or move water out of a generally low lying area. Because of the topography in the study area, all water which inflows into the area is widely dispersed and there isn't a means to easily collect water for pumping, which may also require large pumping distances. Pumps were not considered further.

8. Reservoirs/Detention Ponds/Wetlands.

Reservoirs/detention ponds are used for storage of flood flows for later release. Impacts are generally upstream at the reservoir/detention pond site, while most benefits occur downstream. The Alabama Reservoir was examined as discussed earlier and eliminated because of insufficient capacity. Also, initially, detention ponds were considered for replacing flood plain storage lost through diversion schemes. It was determined that a detention area of about 3 square miles and about 10 feet deep would still not provide for the necessary storage to eliminate downstream impacts in combination with a 100-year protection diversion measure. Initially, existing wetlands were also considered for water management in order to temporarily increase retention capability similar to reservoir/detention ponds. Some public opinion expressed interest to use the wetlands and low lying areas near Baeman Creek State Park; however, these and other wetland areas considered did not have sufficient capacity.

PLAN DEVELOPMENT AND DESCRIPTION

Based on the measures previously described, preliminary plans were developed to address the planning objectives and criteria. Then an initial screening was made of the plans to determine whether or not they could potentially solve the problem. Ultimately, 13 preliminary alternatives (excluding no-action) were developed for evaluation; and are listed as follows:

- Plan 1 - Amherst Diversion, Canal Diversion, 5,000 cfs
- Plan 2 - Amherst/Clarence Diversion, Canal Diversion, 5,000 cfs
- Plan 3 - Tonawanda Creek Improvements, Canal Diversion, 5,000 cfs
- Plan 4 - Ransom Creek Channel Improvements (Local Protection), Canal Diversion, 2,500 cfs
- Plan 5 - Amherst Diversion, Canal Diversion, 2,500 cfs
- Plan 6 - Amherst/Clarence Diversion, Canal Diversion, 2,500 cfs
- Plan 7 - Tonawanda Creek Improvements, Canal Diversion, 2,500 cfs
- Plan 8 - Amherst Diversion, Canal Diversion, 0 cfs
- Plan 9 - Amherst/Clarence Diversion, Canal Diversion, 0 cfs
- Plan 10 - Tonawanda Creek Improvements, Canal Diversion, 0 cfs
- Plan 11 - Tonawanda Creek Improvements, Clarence Diversion, Canal Diversion, 2,500 cfs
- Plan 12 - Barge Canal Diversion, 2,500 cfs
- Plan 13 - Non-Structural (Floodproofing)

Plan sets (1,2,3), (5,6,7), and (8,9,10) are similar except for the amount of diversion discharge to the Erie Barge Canal. The Erie Barge Canal Diversion is a feature of most plans which address the removal of natural flood plain storage and mitigation of subsequently increased downstream flows. Levees downstream have been examined to mitigate increased downstream flows but problems were encountered as explained in the measures section, resulting in

the dependence on the Erie Barge Canal Diversion. Continued coordination and hydrologic and hydraulic investigations determined that the optimum diversion discharge to the Erie Barge Canal is about 3,000 cfs. This would be the optimum discharge allowed without disrupting the Erie Barge Canal integrity, operations, or environments.

It was also determined that this diversion discharge in itself (Plan 12) would reduce flood damages in the project area. However, it would not provide a discernible level of protection and disruption of routing Erie Barge Canal operations would not justify implementation. Therefore, the number of considered plans for evaluation was effectively reduced to six (again excluding no-action); essentially Plans 1, 2, 3, 4, 11, and 13.

Without significant detail, basic features of Plans 1, 2, 3, 4, and 11 are depicted on Plates 13 and 14. Plan 13 is briefly described in the following paragraph.

Plan 13 - Non-Structural (Floodproofing). The feasibility of nine non-structural measures was evaluated. Of the nine measures considered, three specific aspects of floodproofing were identified as appropriate solutions to the flooding hazard considering the severity of flooding as well as site and building characteristics for each structure. These were the installation of check valves, closures, and sealants. The check valve measure involves installing check valves in individual sewerlines to prevent backup, closures involve sealing off low openings, and sealants involve completely sealing the exterior of the house to make it impervious to water.

These six fundamental plans were evaluated for basic engineering and economic feasibility and environmental and social acceptability. A general summary is provided in Table 6 and Table 7. Of the six fundamental plans evaluated, only Plans 4 and 11 warranted further investigation based on minimum Federal evaluation criteria. It was essentially determined that Plans 1, 2, 3, and 13 would not meet basic Federal economic, environmental, and/or implementation criteria. Plan 4 appeared to be a potentially feasible localized protection plan while Plan 11 appeared to be a potentially feasible lower Tonawanda Creek Watershed regional plan. These findings were presented at a June 26, 1989 public workshop.

Plan 3 was evaluated in some further detail at the request of the town of Clarence and residents. Basically they felt that improvements should be fully considered within the existing stream channel. As anticipated, however, the Plan 3 problems (significant soil stabilization problems), likely relocations, associated costs, and environmental concerns (aquatic, riparian, rare and threatened species) increasingly outweighed the plan benefits.

Plan 11 - particularly the portion pertaining to the Clarence Diversion Channel - was formulated to eliminate the problems that would result from upstream modification features of Plan 3. However, concerns were expressed about the proposed Clarence Diversion Channel being located through an existing non-flood plain area and Agricultural District in the town of Clarence. A more southerly route was briefly considered, but the increased length would increase cost. Further, that alignment would fall along several more protected wetland areas.

BUFFALO METROPOLITAN AREA STUDY
Table 6 -Evaluation, and Comparison of Alternative Plans

Item	Plan 1 Asphalt Diversion	Plan 2 Asphalt/Clarence Diversion	Plan 3 Tonawanda Creek Improvements	Plan 4 Ransom Oaks Local Protection	Plan 11 Tonawanda Creek Improvements and Clarence Diversion	Plan 13 Nonstructural Plan
Plan Description	<p>Plan 1 consists of a diversion channel through the Ransom-Black Creek watershed, channel modification to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 14,370 feet of the diversion channel will run from Ransom Creek to about 100 feet west of Westphalinger Road with the westerly Erie Barge Canal. The 28,935 feet of new diversion channel will run from the Erie Barge Canal to a point 12,920 feet upstream, having a bottom width of 120 feet with IV:3H side-slopes. Then the channel would have an average bottom width of 13 feet, and have side-slopes and extend eastward to its upstream end, a system of collector ditches. The channel will require new bridges at: Hopkins Road, New Road, and Millerport Highway and reconstruction of the Transit Road Bridge.</p> <p>Ransom Creek modifications include channelization of Ransom Creek from the Tonawanda Creek bridge upstream to the Hopkins Road bridge, a distance of 8,079 feet. The channel would consist of a 40-foot bottom width having IV:3H side-slopes and would be about 22 feet deep. From Hopkins Road bridge upstream to Millerport Highway bridge, or for a distance of 4,622 feet, the channel bed plus 50 feet on each side of the high flow embankment which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p> <p>Plan 1 involves major channelization of the main stem of Tonawanda Creek, channel improvements and modifications to Ransom Creek and diversion of flows into the Erie Barge Canal. Substantial stream stabilization bank cuts (IV on 3H to IV on 3H), streambank protection (i.e., toe or full riprap protection) and clearing and snagging of the Tonawanda Creek channel is required from the confluence with the Erie Barge Canal upstream to a point which is 400 feet downstream of the Tonawanda Creek Road bridge, a total distance of 88,900 feet. Nine high flow embankment cuts which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p> <p>Plan 1 involves construction of a diversion channel through the Ransom-Black Creek watershed, channel modification to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 14,370 feet of the diversion channel will run from Ransom Creek to about 100 feet west of Westphalinger Road with the westerly Erie Barge Canal. The 28,935 feet of new diversion channel will run from the Erie Barge Canal to a point 12,920 feet upstream, having a bottom width of 120 feet with IV:3H side-slopes. Then the channel would have an average bottom width of 13 feet, and have side-slopes and extend eastward to its upstream end, a system of collector ditches. The channel will require new bridges at: Hopkins Road, New Road, and Millerport Highway and reconstruction of the Transit Road Bridge.</p> <p>Ransom Creek modifications include channelization of Ransom Creek from the Tonawanda Creek bridge upstream to the Hopkins Road bridge, a distance of 8,079 feet. The channel would consist of a 40-foot bottom width having IV:3H side-slopes and would be about 22 feet deep. From Hopkins Road bridge upstream to Millerport Highway bridge, or for a distance of 4,622 feet, the channel bed plus 50 feet on each side of the high flow embankment which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p>	<p>Plan 2 involves construction of a diversion channel through the Ransom-Black Creek watershed, channel modification to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 14,370 feet of the diversion channel will run from Ransom Creek to about 100 feet west of Westphalinger Road with the westerly Erie Barge Canal. The 28,935 feet of new diversion channel will run from the Erie Barge Canal to a point 12,920 feet upstream, having a bottom width of 120 feet with IV:3H side-slopes. Then the channel would have an average bottom width of 13 feet, and have side-slopes and extend eastward to its upstream end, a system of collector ditches. The channel will require new bridges at: Hopkins Road, New Road, and Millerport Highway and reconstruction of the Transit Road Bridge.</p> <p>Ransom Creek modifications include channelization of Ransom Creek from the Tonawanda Creek bridge upstream to the Hopkins Road bridge, a distance of 8,079 feet. The channel would consist of a 40-foot bottom width having IV:3H side-slopes and would be about 22 feet deep. From Hopkins Road bridge upstream to Millerport Highway bridge, or for a distance of 4,622 feet, the channel bed plus 50 feet on each side of the high flow embankment which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p>	<p>Plan 3 involves major channelization of the main stem of Tonawanda Creek, channel improvements and modifications to Ransom Creek and diversion of flows into the Erie Barge Canal. Substantial stream stabilization bank cuts (IV on 3H to IV on 3H), streambank protection (i.e., toe or full riprap protection) and clearing and snagging of the Tonawanda Creek channel is required from the confluence with the Erie Barge Canal upstream to a point which is 400 feet downstream of the Tonawanda Creek Road bridge, a total distance of 88,900 feet. Nine high flow embankment cuts which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p>	<p>Plan 4 consists of channel modifications to Ransom Creek and diversion of flows through the Erie Barge Canal. Ransom Creek modifications include channelization of Ransom Creek from the Tonawanda Creek bridge upstream to the Hopkins Road bridge, a distance of 8,079 feet. The channel would consist of a 40-foot bottom width having IV:3H side-slopes and would be about 22 feet deep. From Hopkins Road bridge upstream to Millerport Highway bridge, or for a distance of 4,622 feet, the channel bed plus 50 feet on each side of the high flow embankment which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p>	<p>Plan 11 involves channel work in the lower portion of Tonawanda Creek, a diversion channel north of Black Creek, channel improvements and modifications to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 28,935 feet of new diversion channel will run from the Erie Barge Canal to a point 12,920 feet upstream, having a bottom width of 120 feet with IV:3H side-slopes. Then the channel would have an average bottom width of 13 feet, and have side-slopes and extend eastward to its upstream end, a system of collector ditches. The channel will require new bridges at: Hopkins Road, New Road, and Millerport Highway and reconstruction of the Transit Road Bridge.</p> <p>Ransom Creek modifications include channelization of Ransom Creek from the Tonawanda Creek bridge upstream to the Hopkins Road bridge, a distance of 8,079 feet. The channel would consist of a 40-foot bottom width having IV:3H side-slopes and would be about 22 feet deep. From Hopkins Road bridge upstream to Millerport Highway bridge, or for a distance of 4,622 feet, the channel bed plus 50 feet on each side of the high flow embankment which would be between 700 to 1,400 feet in length, have a bottom width of 200 feet with IV:3H side-slopes, and would be approximately six feet below the existing ground surface would be required. A control structure would be required across Ransom Creek at its confluence with Tonawanda Creek and a series of low levees or road crossings would start at the intersection of Ransom Creek and behind the intersection of Ransom Creek and Brauer Road and continue for approximately 13,000 feet along Rapid Road and Millerport Highway to the intersection of Millerport Highway and the same as Plan 1.</p>	<p>Plan 13 consists of installing check valves in all structures with basements, in the 500-year floodplain outline. This non-structural plan would prevent sewer backup to over 2,700 structures. However, the plan would not prevent flooding from creeks in the cellar walls, floors or (cellar windows, side entrance doors, etc.). The area would still be flooded from overland flooding.</p>
Level of Protection	100 Year	100 Year	100 Year	25 Year	100 Year	Varies
First Cost (1)	\$20,640,000	\$34,900,000	\$30,200,000	\$3,320,000	\$19,200,000	\$3,437,000
Annual Charges (2)						
Interest & Amortization	\$1,855,000	\$3,322,000	\$2,719,000	\$299,000	\$1,729,000	\$327,000
Annual O&M	25,000	100,000	100,000	50,000	75,000	5,000
Total	\$1,880,000	\$3,422,000	\$2,819,000	\$349,000	\$1,804,000	\$332,000
Average Annual Benefits (2)	\$2,013,000	\$2,147,000	\$2,616,000	\$1,835,000	\$2,330,000	\$322,000
Benefit to Cost Ratio	1.04	.63	.93	2.97	1.29	.97
Average Annual Net Benefits	\$82,000	-	-	\$606,000	\$526,000	-

(1) Based on August 1968 price levels.

(2) Based on August 1968 price levels and 8-7/8 percent interest rate.

Table 7 - Environmental Concerns

Plan 1	Plan 2	Plan 3	Plan 4	Plan 11	Plan 13
Environmental Issues:	Environmental Issues:	Environmental Issues:	Environmental Issues:	Environmental Issues:	Environmental Issues:
<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • Localized • Protection • Community • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • More Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Institutional • More Regional • Protection • Community • Regional Growth • Floodplain • Properties • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • More Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • More Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • Local/Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources

A shorter diversion channel between Tonawanda Creek in the vicinity just west of Goodrich Road and the vicinity just south of Brauer Road was also briefly considered. Required channel modifications along Tonawanda Creek between this confluence and the Plan 11 confluence area would require extensive excavation and relocation of homes, roads, and utilities making this option costly and impractical. Additionally, continued channelization along Tonawanda Creek would heighten environmental concerns pertaining to disruption of aquatic, riparian environments and possibly rare and endangered species habitat. Similar concerns were raised relative to Plan 3. Thus, Plan 11 with the Clarence Diversion was considered the least costly, with lesser adverse impacts than Plan 3. Also, Plan 11 had a favorable B/C ratio.

The town of Clarence and its residents also recommended consideration of a smaller scale project involving use of wetlands and the creation of wetland to provide limited flood protection and environmental enhancement. Use of the Beeman Park wetland areas were mentioned. A cursory evaluation was made but, it was determined that storage capacity needs would be substantial (basically a reservoir plan) and would not be available, flood damage reduction benefits would be negligible; project costs would outweigh benefits (large wetland/reservoir land areas would be required to be effective); and adverse aquatic, wetland, riparian, and terrestrial environmental impacts would likely outweigh beneficial impacts.

PLANS CONSIDERED IN DETAIL

After preliminary plan formulation and evaluation, two plans were considered reasonable and considered in detail along with the no action alternative.

No Action Alternative (Without Conditions). This alternative proposes a continuance of conditions as outlined in the section on EXISTING AND ANTICIPATED FUTURE CONDITIONS or the continuance of without project conditions. The No Action alternative indicates that the Corps of Engineers acting for the Federal Government could take no action based on an evaluation of the problems and possible solutions as directed by the study authority. The No Action alternative is always a possibility and serves as the basis of comparison by which the other possible alternatives may be compared.

Plan 4 - Ransom Creek Channel Improvements (Local Protection). This plan would provide localized 100-year level flood protection to the project vicinity major flood damage area (Ransom Oaks) from run-off from the Ransom Creek watershed, but only up to 25-year level flood protection from overflow of Tonawanda Creek through Black Creek. This local protection project was formulated to provide protection to the area of the highest concentration of damages, the Ransom Oaks area. Project features are depicted on Plates 5, 6, 7, and 8 and are described as follows.

For Plan 4, channelization of Ransom Creek would be required from the Tonawanda Creek Road bridge, at the confluence of Ransom Creek and Tonawanda Creek (Erie Barge Canal), upstream to the Hopkins Road bridge a distance of 8,829 feet. This new channel would consist of a 30-foot bottom width having 1V:2.5H sideslopes and depths up to 16 feet.

From the upstream face of Hopkins Road bridge upstream to the downstream face of the Millersport Highway bridge, or for a distance of 4,338 feet, the channel bed plus 50 feet on each side of the banks would require selective clearing and snagging. Work would consist of removal of dense brush, loose material, and fallen trees.

From the upstream face of the Millersport Highway bridge to the New Road bridge, a cutoff channel along the right bank is required. The cutoff channel will be about 800 feet in length and have a 50-foot bottom width with 1V:2.5H sideslopes and .001 bedslope at an average depth of 6 feet.

From the upstream face of New Road bridge to the downstream face of Glen Oak Drive bridge on Ransom Creek, or for a distance of 6,549 feet, clearing and snagging of the natural channel would be required.

Clearing and snagging of the natural channel of Black Creek would be required from its confluence with Ransom Creek upstream to the downstream face of Smith Road bridge, or for a distance of 446 feet.

Clearing of bridge openings from shoals and sediment would be required on Ransom Creek at the Tonawanda Creek Road bridge, Hopkins Road bridge, and New Road bridge.

In order to prevent increased damages on the lower Tonawanda Creek and the lower reaches of Ransom Creek near its confluence with Tonawanda Creek as a result of this plan, it would be necessary to divert up to 3,000 cfs into the Erie Barge Canal.

Plan 11 - Tonawanda Creek Improvements, Clarence Diversion. This plan would provide regional 100-year level flood protection along major damage areas of Tonawanda, Black, and Ransom Creeks. Project features are as depicted on Plates 9 through 12 and Plates 15 through 19, and includes all the features of Plan 4 described above with the addition of those concerning Tonawanda Creek and the Clarence Diversion. For clarity, all features are described as follows.

For Plan 11, channelization of Ransom Creek would be required from the Tonawanda Creek Road bridge, at the confluence of Ransom Creek and Tonawanda Creek (Erie Barge Canal), upstream to the Hopkins Road bridge a distance of 8,829 feet. This new channel would consist of a 30-foot bottom width having 1V:2.5H sideslopes and averaging 16 feet in depth.

From the upstream face of Hopkins Road bridge upstream to the downstream face of the Millersport Highway bridge, or for a distance of 4,338 feet, the channel bed plus 50 feet on each side of the banks would require selective clearing and snagging. Work would consist of removal of dense brush, loose material, and fallen trees.

From the upstream face of the Millersport Highway bridge to the New Road bridge, a cutoff channel along the right bank would be required. The cutoff channel would be about 800 feet in length and would have a 50-foot bottom width with 1V:2.5H sideslopes and .001 bedslope at an average depth of 6 feet.

From the upstream face of New Road bridge to the downstream face of Glen Oak Drive bridge on Ransom Creek, or for a distance of 6,549 feet, clearing and snagging of the natural channel would be required.

Clearing and snagging of the natural channel of Black Creek would be required from its confluence with Ransom Creek upstream to the downstream face of Smith Road bridge, or for a distance of 446 feet.

Clearing of bridge openings from shoals and sediment would be required on Ransom Creek at the Tonawanda Creek Road bridge, Hopkins Road bridge, and New Road bridge, and on Black Creek at the Westphalinger Road bridge.

Clearing and snagging of Tonawanda Creek channel and selective stream stabilization bank cuts and streambank protection (i.e., toe or fill riprap protection) would be required from about 200 feet downstream of the confluence with the Erie Barge Canal upstream to the confluence of the diversion channel.

Construction of a Diversion Channel north of the Black Creek system would be required. This channel would begin at its junction with Tonawanda Creek near Westphalinger Road and Tonawanda Creek Road. From just south of its junction with Tonawanda Creek it proceeds easterly to a point mid way between Tonawanda Creek Road and Sesh Road on Westphalinger Road. From Westphalinger Road the channel proceeds directly east before heading southeast, paralleling the gas pipeline right-of-way to Sesh Road then it parallels Sesh Road to Goodrich Road. The diversion channel would have a total length of about 13,300 feet, a 250-foot average bottom width and 1 vertical on 3 horizontal sideslopes. The diversion channel would have a typical depth of 9 feet. Disposal of some of the excavated materials would be along the channel overbanks to fill low areas and the remaining excavated materials will be disposed of in an area adjacent to the channel.

A system of collector ditches would be constructed upstream (east) of Goodrich Road to funnel flood waters into the Diversion Channel.

A new bridge would be required on Tonawanda Creek Road just east of Westphalinger Road to span the diversion channel. The new bridge would have a 105-foot clear span and riprap would be placed upstream and downstream of the bridge.

Low flow highway crossings would be required at Northfield Road and Goodrich Road. The crossings for these roads would be constructed such that flows of 1,000 cfs (less than a 10-year flood event) or less would flow through a series of culverts under the road. However, flows greater than 1,000 cfs in the Diversion Channel would flow over the roadway.

In order to prevent increased damages on the lower Tonawanda Creek and the lower reaches of Ransom Creek near its confluence with Tonawanda Creek as a result of this plan, it would be necessary to divert up to 3,000 cfs into the Erie Barge Canal.

PLAN ASSESSMENT AND EVALUATION

This section covers the evaluation and comparison of the plans examined in detail along with the no action alternative, the rationale for selection of the national economic development plan and the rationale for selection of the tentatively selected plan.

EVALUATION AND COMPARISON OF ALTERNATIVES

The evaluation of plan effects consists of assessment and appraisal. Assessment is the process of measuring or estimating the effects of an alternative plan, and it uses the difference between the without plan and with plan conditions for each of the categories of effects. Appraisal is the process of assigning social values to the technical information gathered as part of the assessment process. This appraisal includes setting up a system of accounts to determine the relative contribution of each plan to the national economic development, environmental quality, regional development, and social well-being accounts. The systems of accounts is presented in Table 8.

The comparison of plans focuses on the differences among the alternative plans as determined during the evaluation phase. The differences are organized on the basis of effects defined by the system of accounts. During the comparison, the Corps is required to designate a NED Plan. The NED Plan is the plan which reasonably maximizes the net economic benefits. The comparison phase will often require some type of trade-off analysis.

National Economic Development (NED) Criteria. Plan 4 partially addresses the planning objective of reducing urban and agricultural flood damages and is the plan which reasonably maximizes the NED development benefits when compared to other considered alternatives. Plan 4 maximizes NED benefits and has a benefit-cost ratio of 1.6. The total reduction in damages, however, is small in relation to Plan 11 as Plan 4 provides only 25-year protection in the limited area of the Ransom Oaks development along Ransom Creek. Plan 4 would have limited positive effects on: use of farmlands; reduction in flood insurance overhead costs; or reduction in additional landfill and building costs for new homes. Plan 11, which also addresses the planning objective of reducing urban and agricultural flood damages, does not provide more NED benefits than Plan 4 and has a benefit-cost ratio of 1.01. Plan 11 provides: a 100-year level of protection to structures in Ransom Oaks development along Ransom Creek and east to Goodrich Road in Clarence; a 100-year level of protection to structures along Tonawanda Creek from the Barge Canal upstream to the diversion channel in Clarence; and for the most part 100-year level of protection for agriculture areas in the previously mentioned areas. Plan 11 differs from Plan 4 in that it has the Clarence Diversion Channel and improvements on Tonawanda Creek. That additional separable unit is not incrementally justified at an annualized cost of \$1,594,600 and annualized benefits of \$1,500,200. With the No Action Alternative, the average annual flood damages of nearly \$1,620,000 would continue and the planning objectives go unmet.

Evaluation Parameters	No Action Without Project Conditions	Plan 4		Plan 11 Channel Tonawanda Clarence Diversion
		Channel Ransom Creek Ransom Oaks Protection	Channel Ransom Creek Ransom Oaks Protection	
Economics				
Benefits/Costs				
Project Cost	(Not Applicable)	1,940,000	1,940,000	17,950,000
Federal	-	1,455,000	1,455,000	12,710,000
Non-Federal	-	485,000	485,000	5,240,000
Average Annual	-			
Benefits	-	311,300	311,300	1,811,500
Costs	-	194,900	194,900	1,789,500
B/C	-	1.60	1.60	1.01
Net Benefits	-	116,400	116,400	22,000
Natural Environment				
(Resources)				
Air Quality	Ambient air quality would remain unchanged, or improve in the long-run, if Federal, State, and County air quality standards and monitoring techniques become even more upgraded in the future.	ST: Minor Adverse LT: Not Significant ST: Temporary noise and some smoke, odor, fugitive dust, carbon dioxide and carbon monoxide emissions during about one construction season, causing some short-term localized degradation of air quality in the vicinity of Ransom Creek. LT: Return to ambient air quality conditions when construction work is completed.	ST: Moderate Adverse LT: Not Significant ST: Similar short-term adverse impacts as for Plan 4, but the localized adverse impacts would also occur in the vicinity of project site locations on Tonawanda Creek where heavy construction equipment would be operated. Such short-term degradation of air quality could occur during approximately two construction seasons. LT: Return to ambient air quality conditions when construction work is completed.	ST: Moderate Adverse LT: Not Significant ST: Similar short-term adverse impacts as for Plan 4, but the localized adverse impacts would also occur in the vicinity of project site locations on Tonawanda Creek where heavy construction equipment would be operated. Such short-term degradation of air quality could occur during approximately two construction seasons. LT: Return to ambient air quality conditions when construction work is completed.
Water Quality	Ambient water quality would remain basically unchanged, or improve in quality in the long-run, if Federal, State, and County water quality standards become even more upgraded in the future.	ST: Moderate Adverse LT: Moderate Adverse ST: Temporary short-term increased turbidity in Ransom Creek during construction. Some minor amount of oil or grease spillage during normal operation of heavy equipment may occur. LT: Return to ambient water quality conditions when construction work is completed.	ST: Moderate Adverse LT: Moderate Adverse ST: Similar short-term adverse impacts on water quality as for Plan 4, but the adverse impacts would also occur in the vicinity of project site locations on Tonawanda Creek - as well as to some degree downstream with regard to increased turbidity - from disruption of silt, sediment and detritus in the aquatic environment by construction equipment. Such short-term disruption to water quality may occur during two construction seasons. LT: Return to ambient water quality conditions when construction work is completed.	ST: Moderate Adverse LT: Moderate Adverse ST: Similar short-term adverse impacts on water quality as for Plan 4, but the adverse impacts would also occur in the vicinity of project site locations on Tonawanda Creek - as well as to some degree downstream with regard to increased turbidity - from disruption of silt, sediment and detritus in the aquatic environment by construction equipment. Such short-term disruption to water quality may occur during two construction seasons. LT: Return to ambient water quality conditions when construction work is completed.

Table 8 - System of Accounts (cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions	With Project Conditions	Channel Ransom Creek Ransom Oaks Protection	Channel Tonawanda Clarence Diversion		
Benthos						
No adverse impacts due to a Federal project would occur on benthic habitat and associated benthic invertebrates, since no Federal project would be constructed.			ST: Major Adverse LT: Moderate Adverse ST: About 10.7+ acres of existing benthic habitat would be significantly disrupted by construction; of this acreage, approximately 2.5+ acres of such habitat would be filled-in along the Creek's east bank. Selective clearing and snagging over a stream length of about 10,887 feet in Ransom Creek and 446 feet on Black Creek, would further destroy some existing benthic habitat and associated invertebrates during removal of and fallen trees, submerged snags and channel debris. LT: Less diversity of benthic habitat would be anticipated where channelization and creek diversion altered Ransom Creek. About 3.2+ acres of new benthic habitat would be created in the channel where the Creek was widened by excavation. Channelized areas of the Creek would also provide habitat for eventual recolonization by aquatic invertebrates, however, benthic habitat diversity would be decreased.	ST: Major Adverse LT: Moderate Adverse ST: Similar short-term impacts on benthos in Ransom Creek as described in Plan 4. Some disruption of benthic habitat would also occur on Tonawanda Creek, which involves selective clearing and snagging over a length of about 20,500 feet. Further disruption to benthic habitat and associated invertebrates in Tonawanda Creek would be incurred by construction of the following structural measures: bank sloping (1.1+ acres); channel deepening (3.8+ acres) and etc (1.1+ acres). Submerged disrupted habitat (0.1+ acres). Construction work was completed. LT: Similar long-term impacts on benthos in Ransom Creek as described in Plan 4. New aquatic substrate habitat for recolonization of benthic invertebrates would also be available where channel substrate was disrupted by bank sloping, channel deepening, and placement of stone riprap on Tonawanda Creek.		
Fisheries						
No adverse impacts due to a Federal project would occur to fisheries, since this alternative implies that no Federal project would be constructed. Fish would continue to utilize Tonawanda Creek and its tributaries.			ST: Major Adverse LT: Major Adverse ST: Significant alteration of fish habitat in Ransom Creek by channelization and channel diversion by selective clearing and snagging. Approximately 10.7+ acres of existing fish habitat would be disrupted by these structural measures. Channel substrate would be disrupted. In-stream fishery habitat diversity would be decreased and some spawning and/or nursery habitat may be disrupted or destroyed. Construction activity including removal of submerged snags, fallen trees or other in-stream obstructions during snagging and clearing, would probably temporarily disrupt fish movement into and out of Ransom Creek to some degree. LT: Long-term alteration of fish habitat in Ransom Creek would be anticipated where the creek was altered by channelization and channel diversion. Decreased in-stream diversity would continue in the channelized and widened reach of the Creek, and this zone would also remain more open and sparse in shade cover. About 0.8 acres of new fish habitat would be created by diversion of the Creek, but such habitat would be less diverse and unshaded. Diversion of some of Tonawanda Creek's floodwater through the Erie Harge Canal, may flush some fish eggs from the canal; also, there may be some periodic deposition of silt and sediment in the canal brought in by diverted water flow, that could cover fish habitat substrate to some degree.	ST: Major Adverse LT: Major Adverse ST: Similar short-term impacts on fisheries in Ransom Creek as described in Plan 4. Significant disruption of fishery habitat would also occur on Tonawanda Creek which involves selective clearing and snagging over a length of about 20,500 feet. Further disruption to fisheries habitat in Tonawanda Creek would be incurred by construction of the following structural measures: bank sloping (1.1+ acres); channel deepening (3.8+ acres), and stone riprap (0.1+ acre). LT: Similar long-term impacts on fisheries in Ransom Creek as described in Plan 4. New habitat created by submerged riprap stone on Tonawanda Creek, as well as new aquatic habitat created the Ransom Creek diversion, would contribute toward some replacement of lost or altered fish habitat.		

Table 8 - System of Accounts (cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions		Channel Ransom Creek	Ransom Oaks Protection	Channel Tonawanda	Clarence Diversion
Wildlife	No adverse impacts due to a Federal project	ST: Major Adverse	ST: Major Adverse		ST: Major Adverse	
	would occur to wildlife, since this alternative	LT: Moderate Adverse	LT: Moderate Adverse		LT: Major Adverse	
	implies that no Federal project would be					
	constructed. Transient, seasonal, and endemic					
	wildlife would continue to utilize habitats in					
	the study locale of Tonawanda Creek, Ransom					
	Creek, and Black Creek. Terrestrial, wetland,					
	and aquatic wildlife habitats would continue to					
	experience uncontrolled periodic flooding events					
	that could disrupt adult and young of the year					
	wildlife species to some degree.					
Vegetation	No adverse impacts due to a Federal project	ST: Significant Adverse	ST: Significant Adverse		ST: Significant Adverse	
	would occur to vegetation, since this	LT: Significant Adverse	LT: Significant Adverse		LT: Significant Adverse	
	alternative implies that no Federal project					
	would be constructed. Riparian woody and					
	herbaceous vegetation along the creeks, as well					
	as terrestrial vegetation on uplands presently					

Table 8 - System of Accounts (cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions		Channel Ransom Creek Ransom Oaks Protection		Channel Tonawanda Clarence Diversion	
	undergoing early, mid and late plant succession		channelization and channel diversion construction.		north bank of Ransom Creek would destroy and disrupt	
	would continue to occur, unless further		selective clearing and snagging would destroy		more riparian vegetation. The cut-off channel would	
	development interrupts such plant growth in the		additional riparian vegetation along Ransom Creek in		destroy about 1.6+ acres of such vegetation along with	
	future.		scattered locations.		some upland forbs and shrubs. No significant adverse	
			LT: Significant reduction in riparian vegetation along		impact on aquatic vegetation in Tonawanda Creek is	
			Ransom Creek would be long-term - lasting for at least		anticipated. Construction of structural measures on	
			the life of the project. Soils on disrupted		Tonawanda Creek would destroy about 4.1+ acres of	
			terrestrial bank slopes would be seeded maintained in		riparian woody and herbaceous vegetation.	
			low growth herbaceous grass or grass-legume cover.		Additionally, construction of the Clarence diversion	
			Diversity of plant growth would be decreased.		channel will destroy about 9+ acres of upland	
					vegetation - predominantly in early, mid, and late	
					successional fields containing young hardwood trees,	
					shrubs, forbs, and grasses with scattered sedges and	
					rush - as well as about 3 acres of deciduous	
					tree/shrub wetland. Selective clearing and snagging	
					would also eliminate primarily woody plants such as	
					trees and shrubs in scattered areas along about 20,500	
					feet of Tonawanda Creek. Additionally, deposition of	
					excavated material from project construction would	
					destroy existing terrestrial vegetation diversity over	
					about 104.4 acres of prime farmland soil located on	
					the south side of the proposed Clarence diversion	
					Channel between Westphalinger Road and Northfield	
					Road.	
					LT: Similar long-term impacts in Ransom Creek as	
					described in Plan 4. Herbaceous seedlings on soils in	
					the Clarence Diversion Channel, spoil deposition area	
					and in the cut-off channel would be done to provide	
					such long-term herbaceous plant cover over approxima-	
					tely 30+ acres of upland area. Spoil deposited at	
					the deposition site would be graded and seeded with a	
					grass or grass-legume mixture, however, eventually, if	
					the site is left unmanaged, undeveloped and not	
					farmed, native plants would be expected to invade	
					this fill material and return some of the lost habitat	
					diversity.	

Table 8 - System of Accounts (cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions		Channel Ransom Creek Ransom Oaks Protection		Channel Tongawanda Clarence Diversion	
Wetlands	Since this alternative implies that no Federal project would be constructed, no adverse impacts due to project construction would occur to wetlands.	ST: Not Significant LT: Not Significant ST: No wetlands would be significantly adversely impacted by proposed channelization, channel diversion and clearing and snagging on Ransom Creek. LT: Similar to the above.		ST: Significant Adverse LT: Minor Adverse ST: About 3.04 acres of existing semipermanent deciduous tree-shrub swamp would be eliminated by direct excavation of the Clarence diversion channel. LT: Possible adverse impact on two wetlands due to influence of the deep diversion channel, which may cause some lateral drainage beyond the immediate excavation site. Since such drainage could further alter these wetlands to some degree, appropriate engineering measures would need to be taken during design and construction to preclude such a potential adverse impact. Lost wetland due to construction would be replaced to achieve no net loss of this natural resource.		ST: Significant Adverse LT: Minor Adverse ST: About 3.04 acres of existing semipermanent deciduous tree-shrub swamp would be eliminated by direct excavation of the Clarence diversion channel. LT: Possible adverse impact on two wetlands due to influence of the deep diversion channel, which may cause some lateral drainage beyond the immediate excavation site. Since such drainage could further alter these wetlands to some degree, appropriate engineering measures would need to be taken during design and construction to preclude such a potential adverse impact. Lost wetland due to construction would be replaced to achieve no net loss of this natural resource.
Threatened/Endangered Rare Species	Since this alternative implies that no Federal project would be constructed, no adverse impacts on threatened, endangered or rare species would occur.	ST: Not Significant LT: Not Significant ST: Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service would occur. No significant adverse impacts on threatened or rare species listed by the MYSDEC would be anticipated in Ransom Creek. LT: No significant adverse impact.		ST: Moderate Adverse LT: Moderate Adverse ST: No significant short-term adverse impacts on threatened, endangered or rare species as described in Plan 4 for the Ransom Creek portion of alternative Plan 11. With regard to Tongawanda Creek, except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service would be adversely affected. However, structural measures proposed for Tongawanda Creek may have some degree of adverse impact on a MYSDEC listed threatened species of fish - the long-eared sunfish, as well as species listed as rare by the NY Heritage Program - which includes the huddled madtom and some clam. Substrate removal and disturbance by construction on Tongawanda Creek, could disrupt or alter some habitat of the aforementioned sunfish, and possibly destroy or displace some of the rare clam that might be utilizing the aquatic substrate as habitat in the general vicinity of the project site. LT: There may be some moderate adverse long-term loss or alteration of aquatic habitat for the long-eared sunfish and rare clam species in Tongawanda Creek - where channel deepening or bank slope work is done below the water line.		ST: Moderate Adverse LT: Moderate Adverse ST: No significant short-term adverse impacts on threatened, endangered or rare species as described in Plan 4 for the Ransom Creek portion of alternative Plan 11. With regard to Tongawanda Creek, except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service would be adversely affected. However, structural measures proposed for Tongawanda Creek may have some degree of adverse impact on a MYSDEC listed threatened species of fish - the long-eared sunfish, as well as species listed as rare by the NY Heritage Program - which includes the huddled madtom and some clam. Substrate removal and disturbance by construction on Tongawanda Creek, could disrupt or alter some habitat of the aforementioned sunfish, and possibly destroy or displace some of the rare clam that might be utilizing the aquatic substrate as habitat in the general vicinity of the project site. LT: There may be some moderate adverse long-term loss or alteration of aquatic habitat for the long-eared sunfish and rare clam species in Tongawanda Creek - where channel deepening or bank slope work is done below the water line.

Table 8 - System of Accounts (cont'd)

Evaluation Parameters	Without Project Conditions	Plan 4		Plan 11	
		Channel Ransom Creek Ransom Oaks Protection	Channel Tonawanda Clarence Diversion		
Human (Man-Made) Environment (Resources)					
Community and Regional Growth	<p>Periodic flooding and associated damages would be expected to continue along lower Tonawanda, Black, and Ransom Creeks. Expected new developments need to comply with National Flood Insurance Policy associated regulations. The project area floodplain is about 16,700 acres.</p>	<p>ST: Minor Beneficial LT: Moderate Beneficial The project would provide up to 25 year event level flood protection to Ransom Oaks (a major flood damage area) from Tonawanda Creek via Black Creek. Problems of flooding from Tonawanda and Black Creek would remain. Expected new developments need to comply with National Flood Insurance Policy associated regulations. This plan would impact about 30 acres of land. No reduction in the 100 year event floodplain.</p>	<p>ST: Minor Beneficial LT: Major Beneficial The project would provide 100 year event level flood protection to areas along lower Tonawanda, Black, and Ransom Creeks (including Ransom Oaks). The 100 year event level floodplain would be reduced accordingly. Expected new developments need to comply with National Flood Insurance Policy associated regulations based on revised floodplain designations. This plan would impact about 150 acres of land and reduce the 100 year event floodplain by about 11,000 acres.</p>		
Displacement of People	<p>Periodic flooding and associated temporary displacement of people would be expected to continue along lower Tonawanda, Black, and Ransom Creeks.</p>	<p>ST: Minor Adverse LT: Minor Beneficial Implementation of this plan would likely require acquisition of a home and some properties in close proximity to Ransom Creek.</p>	<p>ST: Moderate Adverse LT: Moderate Beneficial Implementation of this plan would likely require acquisition of several homes and some properties in close proximity to lower Tonawanda and Ransom Creeks and along the diversion channel alignment.</p>		
Displacement of Farms	Not Applicable	<p>ST: Minor Adverse LT: Minor Adverse Implementation of this plan would likely require acquisition of about 30 acres of (potential farmland) land in close proximity to Ransom Creek.</p>	<p>ST: Moderate Adverse LT: Moderate Adverse Implementation of this plan would likely require acquisition of about 150 acres of land adjacent to lower Tonawanda Creek (about 20 acres), Ransom Creek (about 30 acres), and along the diversion alignment (about 90 acres). That along the diversion alignment is primarily active or inactive farmland within the Clarence Newstead (14) agricultural district. Soil wetness is limiting factor in this area.</p>		
Business/Industry Employment/Income	<p>Although most flood damages in the project area pertain to residential developments some pertain to associated commercial developments. Similar to existing flooding conditions and associated flood damages would be expected.</p> <p>Generally, moderate growth in business, employment, and income is anticipated for the region. New developments need to comply with National Flood Insurance Policies.</p>	<p>ST: Minor Beneficial LT: Minor Beneficial Project construction would provide short-term employment for a construction firm and a small work force of employees probably for one construction season. The project would provide up to 25 year event flood protection to the localized Ransom Oaks area (including a few commercial developments) from Tonawanda Creek via Black Creek. Associated periodic flooding disruptions and damages would be alleviated.</p>	<p>ST: Moderate Beneficial LT: Moderate Beneficial Project construction would provide employment for one or more construction firms and associated employees probably for two or more construction seasons. The project would provide 100 year event level flood protection to the floodprone Tonawanda, Black, and Ransom Creeks area (including a few commercial developments). Associated periodic flooding disruptions and damages would be alleviated.</p>		
Recreation	<p>Anticipated regional recreational demands include those for facilities for: boating, swimming, biking, hiking, golfing, and relaxing in the park.</p>	<p>ST: Minor Adverse LT: Not Significant Construction related disruption to water quality, fisheries, and associated fishing activities along Ransom Creek. Construction related disruption to Glen Oaks golf course and associated developments. Some project related recreational development potential in the Ransom Creek vicinity.</p>	<p>ST: Minor Adverse LT: Not Significant Construction related disruption to water quality, fisheries, and associated fishing activities along lower Tonawanda and Ransom Creeks. Construction related disruption to Glen Oaks and Green Wood golf courses and associated developments. Some project related recreational development potential in the Tonawanda and Ransom Creeks vicinities.</p>		
Public Facilities and Service	<p>Periodic flooding would continue to disrupt some normal public facilities and services. Public facilities and services would be needed to facilitate associated flood emergency operations.</p>	<p>ST: Minor Adverse LT: Minor Beneficial Some public facilities and services may be utilized to facilitate project construction in the Ransom Oaks vicinity. Police patrols, traffic control. Use of local roads. Relocation of some utilities. Staging areas.</p>	<p>ST: Minor Adverse LT: Moderate Beneficial Some public facilities and services may be utilized to facilitate project construction in the Tonawanda and Ransom Creeks areas. Police patrols, traffic control. Use of local roads. Relocation of some utilities. Staging areas.</p>		

Table 6 - System of Accounts (cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions	Channel Ransom Creek Ransom Oaks Protection	Channel Ransom Creek Ransom Oaks Protection	Channel Tonawanda Clarence Diversion		
Property Values and Tax Revenues	<p>The average value of farmland in Erie and Niagara Counties is roughly estimated at \$2,000 per acre. The project vicinity is a major growth area in the Buffalo Metropolitan area. Property values and associated tax revenues are relatively increased over average values. This is anticipated for some time in the future.</p>	<p>ST: Minor Adverse</p> <p>LT: Minor Beneficial</p> <p>The project would provide up to 25 year event level flood protection to the existing floodprone Ransom Oaks development from Tonawanda Creek via Black Creek. The 100 year event level floodplain would not be altered significantly. Some slight increase in area property values and associated tax revenues may occur. Project costs would be cost shared between Federal, State, and local interests. Thirty acre project construction impact area.</p>	<p>ST: Moderate Adverse</p> <p>LT: Minor Adverse</p> <p>Construction related noise and disruption to area aesthetics would occur in the Ransom Creek (Oaks) vicinity. Although vegetation would be retained or re-planted to the degree possible for aesthetic and fish and wildlife reasons, Ransom Creek would be straightened, deepened, and widened, with generally less riparian vegetation.</p>	<p>ST: Moderate Adverse</p> <p>LT: Moderate Beneficial</p> <p>The project would provide 100 year event level flood protection to floodprone areas along lower Tonawanda, Black, and Ransom Creeks. The 100 year event floodplain would be reduced substantially. Some increase in area property values and associated tax revenues would likely occur. Project costs would be cost shared between Federal, State, and local interests. A 150 acre project construction impact area. Reduces the 100 year event floodplain by 11,000 acres.</p>		
Noise and Aesthetics	<p>With increased developments, associated increased noise, and changed aesthetics would be expected.</p>	<p>ST: Minor Adverse</p> <p>LT: Minor Adverse</p> <p>Construction related noise and disruption to area aesthetics would occur in the Ransom Creek (Oaks) vicinity. Although vegetation would be retained or re-planted to the degree possible for aesthetic and fish and wildlife reasons, Ransom Creek would be straightened, deepened, and widened, with generally less riparian vegetation.</p>	<p>ST: Moderate Adverse</p> <p>LT: Minor Adverse</p> <p>Construction related noise and disruption to area aesthetics would occur in the lower Tonawanda Creek, diversion channel, and Ransom Creek project areas. Although vegetation would be retained or re-planted to the degree possible for aesthetic and fish and wildlife reasons, creek channels would be straightened, deepened, and widened with generally less riparian vegetation. Tree and shrub vegetation would be removed along the Clarence diversion alignment and the relatively flat terrain would be altered to that of the diversion channel.</p>	<p>ST: Moderate Adverse</p> <p>LT: Moderate Beneficial</p> <p>The project would provide 100 year event level flood protection to floodprone Tonawanda, Black, and Ransom Creeks areas. The 100 year event level floodplain would be reduced substantially. Because of the more regional scope of the project increased adverse environmental impacts due to project implementation would occur; however, more regional flood damage reduction benefits would be realized.</p>		
Community Cohesion	<p>Flooding and associated problems and concerns would be expected to continue. Continued National Flood Insurance Policy associated regulations in floodplain areas. Continued developmental concerns.</p>	<p>ST: Minor Adverse</p> <p>LT: Minor Beneficial</p> <p>The project would provide up to 25 year even level flood protection to the localized Ransom Oaks vicinity from Tonawanda Creek via Black Creek. Potential flooding problems from Tonawanda via Black Creek would remain. The 100 year event level floodplain would not be significantly altered. Because of the localized scope of the project fewer adverse environmental impacts due to project implementation would occur; however, few regional benefits would be realized.</p>	<p>ST: Minor Adverse</p> <p>LT: Minor Beneficial</p> <p>The project would provide 100 year event level flood protection to floodprone Tonawanda, Black, and Ransom Creeks areas. The 100 year event level floodplain would be reduced substantially. Because of the more regional scope of the project increased adverse environmental impacts due to project implementation would occur; however, more regional flood damage reduction benefits would be realized.</p>	<p>ST: Minor Adverse</p> <p>LT: Not Significant</p> <p>A cultural resources survey has been conducted for the project vicinity. Several areas of potential cultural resource significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to project construction (Three areas involved).</p>		
Cultural Resources	<p>Reference statements for Plan 4 and Plan 11.</p>	<p>ST: Minor Adverse</p> <p>LT: Not Significant</p> <p>A cultural resources survey has been conducted for the project vicinity. Several areas of potential cultural resource significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to project construction (Three areas involved).</p>	<p>ST: Minor Adverse</p> <p>LT: Not Significant</p> <p>A cultural resources survey has been conducted for the project vicinity. Several areas of potential cultural resource significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to project construction (Three areas involved).</p>	<p>ST: Minor Adverse</p> <p>LT: Not Significant</p> <p>A cultural resources survey has been conducted for the project vicinity. Several areas of potential cultural resource significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to project construction (Five areas involved).</p>		

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Environmental Quality (EQ) Criteria. Most of the environmental impacts associated with Plan 4 would be due to the location of channelization and the clearing and snagging of the existing channel. These impacts would be mitigated through use of varying design/construction methods including for example limiting construction to one bank of the creek. For Plan 11, the actual location of the diversion channel and the disposal areas will destroy wetland and terrestrial habitat and there would be channelization impacts on Tonawanda Creek, in addition to the impacts of Plan 4. Mitigation for Plan 11 would be the same regarding varying design/construction methods along Ransom Creek although additional wetland habitat would be created to avoid any "net loss" to wetlands and disposal areas landscaped and planted. If no action is taken, the present conditions would likely prevail although the effects of urbanization may reduce terrestrial habitat and natural succession may result in a loss of wetland.

Regional Development (RD) Criteria. Plan 4 may have the potential for a small improvement in RD because of the limited level and geographical extent of protection and because it does not provide protection to agricultural areas. Plan 11, because of implementation out lays, positive effects on regional employment, and agricultural intensification of farmland are all likely to allow growth in per capita income making Plan 11 the most favorable on Regional Development. The no action alternative is likely to have no net impact or insignificant impact on RD.

Social Well-Being (SWB) Criteria. Plan 4 would provide only 25-year level of protection to ensure human safety and would enhance human health by reducing frequent floods in a very small area. Plan 4 would result in the displacement of one household. Plan 11 would provide a suitable 100-year level of protection and enhance human well being in a much larger area. Plan 11 would result in the displacement of 5 households though suitable housing is likely to be found within the area. With the no action plan, the present hazardous condition with regard to flooding and human well being would remain.

RATIONALE FOR DESIGNATION OF THE NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN

The Principles and Guidelines define the NED plan as the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment. Plan 4 provides the greatest net economic benefits and minimizes plan induced negative environmental impacts. Plan 4 is therefore designated as the NED plan.

RATIONALE FOR SELECTING A PLAN

The Principles and Guidelines require selecting the alternative plan with the greatest net economic benefit consistent with protecting the Nation's Environment (NED Plan). As stated in the previous section, Plan 4 is the NED Plan. However, the Secretary of the Army, in this case for a Corps of Engineers recommendation, may grant an exception when there is some overriding reason for selecting another plan, based upon other Federal, State, local, and international concerns.

A plan recommending Federal action should consider risk and uncertainty and reasonably address the criteria of completeness, effectiveness, efficiency, and acceptability. Uncertainty and the above criteria are discussed here relative to Plan 4 and Plan 11 as they may present compelling reasons favoring selection of Plan 11 or selection of other than Plan 4, the NED Plan.

At this time, there is considerable uncertainty related to the without project conditions for which all plans are compared. A Limited Map Maintenance Program (LMMP) study in the town of Amherst covering Tonawanda, Ransom, and Black Creeks is currently ongoing with the Corps. This LMMP is being conducted for the Federal Emergency Management Agency (FEMA). The current analysis finds a considerable expansion of the designated floodway in the town of Amherst likely, thus, considerably reducing and ultimately making undevelopable large portions of the current flood plain. With a possible expansion in floodway designation, the without project conditions could be considerably different than those reported. Any FEMA formal action on a floodway change may not occur for sometime. Since this potential condition was not fully realized till late in this study, alternative features could not be evaluated and plans are based on current floodway designations.

Plan 4 is the NED Plan. It maximizes net economic benefits with fewer induced negative environmental impacts. Plan 4 is not complete in itself in that additional investment and commitments regarding the operation and maintenance of the Barge Canal are needed. Plan 4; however, is deficient in its effectiveness and acceptability. Plan 4 only addresses a small damage area and reduces the existing average annual flood damages by about 23 percent without any reduction in agricultural damages. This would leave substantial portions of an urban area within the post-project 100-year flood plain. Plan 4's viability, with respect to acceptability by local entities, is also in question. Plan 4 would provide only 25-year level of protection, not the minimum of 100-year protection necessary to eliminate flood insurance premiums to those within the 100-year flood plain. Further, the local residents would likely be assessed an amount to pay for the non-Federal share of the project in addition to the continuance of flood insurance premiums. Because Plan 4 would provide minimum protection to such a local area, NYSDOT may also be unwilling to operate the Barge Canal for such minimal protection. Also, no local support has ever been expressed for Plan 4.

Plan 4 has some uncertainty associated with the operation of the portion of the plan dealing with diversion of flood flows into the Erie Barge Canal. The plan of operation considered use of the Erie Barge Canal's five existing

control weirs to convey flow out into surrounding streams. It is anticipated, based upon customary canal operations in the past, that the releases of water into the other stream probably will not cause significant environmental impacts. It is anticipated that flows released into other streams will not add to peak flood flows in those streams. Also, it is not anticipated that sedimentation in the Erie Barge Canal will be a problem, though no study has been done.

Plan 4 has some uncertainty related to disposal of some excavated materials in the park at Millersport and Smith Road in the town of Amherst. It is anticipated that in wetlands or waters of the United States will be affected, however, further examination will be necessary.

For Plan 11, would not be as economically efficient as Plan 4 in that it is not the NED Plan. Plan 11 is not complete in itself in that it would require additional investments and commitments regarding the Barge Canal. However, Plan 11, based on effectiveness and acceptability should be considered.

Plan 11 would be effective in that it would provide region-wide 100-year level of protection and would reduce the existing average annual flood damages, including agricultural damages, by about 64 percent. With 100-year level of protection provided by Plan 11, there would be no need for local residents to pay flood insurance premiums. A reduction in future net subsidized reimbursements for flood losses, both insured and uninsured, could result from the plan.

Regarding acceptability, Plan 11 has the support of the town of Amherst, but no other support has been expressed. Because of the significant benefits provided, NYSDOT is also presumably more likely to operate the Barge Canal as a part of the flood management plan.

Plan 11 has the same uncertainties as Plan 4 dealing with the Erie Barge Canal operation. Additional uncertainty is primarily associated with impacts of the Clarence Diversion Channel including the impact of a second pipeline crossing the alignment, the impact of the disposal area on surrounding drainage; the impact of the diversion channel on surrounding groundwater table; and the impact on wetlands near the diversion channel from lateral drainage. Surface lateral drainage was addressed in the plan by a berm, leaving subsurface lateral drainage in need of further evaluation.

Plan 11 would require significant financial outlay over and above Plan 4, the result being the additional amount of protection, additional dollar reduction in damages and additional geographical extent or regional benefit. However, those positive additions for Plan 11 over and above Plan 4 are due to the Tonawanda Creek improvements and the Clarence Diversion, which as last added increments to the features of Plan 4 are not economically justified. For this reason alone, Plan 11 cannot be selected.

Summarizing, Plan 4 is the NED Plan and although implementation of that plan may be in question, it is the "tentatively selected" plan as the competing Plan 11 does not pass the incremental justification test. Plan 4 is the "tentatively" selected plan because without a firm commitment of the local sponsor, namely NYSDEC, it is unreasonable to select an alternative without qualifying that selection.

DESCRIPTION OF THE TENTATIVELY SELECTED PLAN

This section is to provide information regarding the tentatively selected plan components, mitigation associated with the plan, design and construction considerations, operation and maintenance considerations, plan accomplishments including economic, environmental, and other social effects.

PLAN COMPONENTS

The Ransom Creek Channel Improvement Plan (Plan 4) consists of channelization of Ransom Creek from Tonawanda Creek Road upstream to Hopkins Road; clearing and snagging from Hopkins Road to Millersport Highway; a cutoff channel from New Road to Millersport Highway; clearing and snagging from New Road to Glen Oak Drive; shoal and sediment removal at Tonawanda Creek Road, Hopkins Road, and New Road bridges; clearing and snagging of Black Creek from Ransom Creek to Smith Road; and diversion of water into the Erie Barge Canal. A detailed description of Plan 4 was given earlier in this report.

Mitigation for Plan 4 to minimize impacts on aquatic and riparian habitats consists of: single side channelization, to the extent possible, of Ransom Creek between Tonawanda Creek Road and Hopkins Road; clearing and snagging based on utilization of coordination with environmental interests to specifically map obstructions for removal; reseeding of the cutoff channel will take place immediately following construction; no in water construction between March 1 and June 1; disposal of materials upland to avoid reentry into waters or wetlands; if possible, channel improvements will be made with hand tools or if not the minimum size machinery necessary; and the state fishery biologist will be notified of the operation plan and of major flow releases to the Erie Barge Canal, to the extent a flood emergency will allow.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Structural design considerations for this project were chiefly those related to channelization and the stability of channel and cutoff channel side slopes. Analysis of soil parameters indicated that excavated slopes should not be steeper than 1 vertical on 2.5 horizontal for stability and maintenance purposes. Failure of the channel was not considered a significant issue as failure would be slow and non-life threatening.

Hydraulic design considerations were that the new channels have sufficient capacity and that clearing and snagging of obstructions and debris be sufficient to improve channel conveyance.

OPERATION AND MAINTENANCE CONSIDERATIONS

There are two components of Plan 4 that would require operating decisions to be made during floods. A control structure would be required to divide the overflow from Tonawanda Creek into the proposed diversion channel and natural channel. In addition, the increase in discharge in Tonawanda Creek due to the proposed project would be diverted down the Erie Barge Canal. Both of these actions would require making real-time operational decisions.

The operating policy that was developed for dividing flow between the natural channel and the proposed diversion channel considers all flow above the proposed diversion channel's capacity be returned to the natural channel. The operating policy is basically to have all flow in Black Creek up to 1,000 cfs stay in the natural channel (all flow measured at Goodrich Road). All flow above 1,000 cfs would be diverted into the diversion channel until the diversion channel capacity was met. The diversion design capacity is 6,000 cfs, but the operating policy uses 5,700 cfs as the diversion capacity. Once the diversion flow reached 5,700 cfs, all the remaining flow would stay in the natural channel.

The excess flow diverted down the Barge Canal would be based on the flow in Tonawanda Creek just upstream of the Barge Canal. For a given flow in Tonawanda Creek, a set amount of flow would be diverted down the Barge Canal. This operating policy would constrain the peak discharges downstream of Ransom Creek to be less than or equal to the existing conditions peak discharges. Under this operating policy, flow would have to be diverted down the Barge Canal approximately once every ten years. Refinements to this operating policy could reduce the frequency of diversion.

A hydrologic data collection system for Tonawanda Creek would be constructed to handle the real time operating decisions necessary for efficient operation of the project to Tonawanda Creek just upstream of the Barge Canal. A new gage would be required on Black Creek at Goodrich Road for operation of the diversion channel control structure. More detailed information and procedures on the operation of the proposed project would be done during the preparation of the operating and maintenance manual for the project.

The New York State Department of Transportation (NYSUOT) operates and maintains the Barge Canal. Only minor structural improvements to the Barge Canal itself would be required to pass the diverted flow. Some changes in the operation of the canal would be required. During the winter, when the canal is emptied, advance notice would be required to remove any maintenance crews in the canal and locks and canal watchers will be required to walk the banks, as they do during the summer months. The diverted flow would be stored in the canal prism to be released later into the small creeks and tributaries flowing near or under the canal. The outlet structures already exist for this operation. During the summer months, some of the diverted flow would be stored in the prism and the rest would be released from the canal into the small streams near the canal.

Additional operations and maintenance requirements are associated with maintenance of the channels. Mowing of channel sideslopes and clearing and snagging to maintain the channel conveyance will be necessary.

PLAN ACCOMPLISHMENTS

The plan accomplishments are below described broken down by economic, environmental, and social well being accounts.

Economic Evaluation Benefits. Urban flood benefits that would be realized as a result of implementing Plan 4 total \$311,300, annually (Table 9). All benefits are in October 1989 prices and reflect an 8-7/8 percent annual interest rate, a fifty year project life, and a project year one date of 1995. Urban flood benefits are the differences between "Without Project" and "With Project" urban flood damages.

Most of these damages are the result of first floor flooding of structures. If the damaged structures are homes, the damage category is "Residential Damages." If the damaged structures are commercial or industrial, they are termed "Commercial" or "Industrial" damages. "Public and Other" damages include damages to public buildings (police stations, firehouses, schools, churches, etc.) and contents as well as roads in the project area. Also included are public sector emergency services and cleanup costs, and if appropriate, detour costs.

Table 9 - Plan 4 Benefit Summary (1)

Reaches	Structures	Contents	Commercial	Public and Other	Total
:	\$	\$	\$	\$	\$
RB1	31,900	30,400	0	1,700	64,000
RB2	127,500	103,000	200	2,700	233,400
RB3	2,700	2,200		9,000	13,900
RB4					0
					311,300

(1) Benefits are in average annual dollars, October 1989 prices, and includes affluence. The benefits are based upon an 8-7/8 percent annual interest rate and a 50 year project life.

Residential damages were estimated at various flood depths based on established Buffalo District depth-percent damage relationships for typical residential structures in the project area. First floor elevations, type of structure and value of structure were used to determine damages at various depths.

All commercial damage estimates are based upon personnal interviews with the commercial establishments in the project area during November and December 1975. These values were updated to October 1989 price levels. The interviews provided estimated damages to structures, inventory and machinery, lost wages, and expected cleanup costs.

Public and Other damages include flood cleanup costs on public roads and buildings, repairs to utilities and roads, emergency evacuation costs (additional on duty time for police, firemen, etc.) temporary emergency shelters and relief costs, and detour costs.

Stage damage curves were developed for residential, commercial, and public and other uses. These damage curves were used with discharge-frequency curves and stage discharge curves to obtain damage frequency curves for the "without project" condition of development. The value of residential content damages were developed to grow at a 1.07 percent annual rate from the study year 1989, to the end of the study evaluation period, 2045.

A similar analysis was performed to obtain "with project" condition damages since Plan 4 will not eliminate all damages in the study area. Residential content damages were also allowed to grow at a 1.07 percent annual rate from the study year 1989 to the end of the study evaluation period, 2045.

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Costs. A summary of average annual costs are presented in Table 10. These costs came to \$194,900 which included \$177,900 for interest and amortization and \$17,000 for annual maintenance. Project investment costs included interest during construction with was computed using a one year construction season, monthly compounding, and an 8-7/8 percent annual interest rate.

Table 10 - Plan 4 Cost Summary
(October 1989 Price Levels)

Total Investment Costs	Plan 4 \$
Construction Costs	1,940,000
Interest During Construction	36,500
Investment Costs	1,976,500
Average Annual Costs	
Interest	175,400
Amortization	2,500
Annual Operation and Maintenance	17,000
Average Annual Costs	194,900

Net Benefits and Benefit to Cost Ratio. Table 11 shows average annual benefits, average annual costs, net benefits, and benefit to cost ratio for Plan 4. Plan 4 had average annual benefits of \$311,300, average annual costs of \$194,900, net benefits of \$116,400, and a benefit to cost ratio of 1.6.

Table 11 - Plan 4 Benefit to Cost Summary
(October 1989 Price Levels)

	Plan 4 \$
Average Annual Benefits	311,300
Average Annual Costs	194,900
Net Benefits	116,400
Benefit to Cost Ratio	1.6

Environmental and Social Well Being. The effects on the environment and social well-being of the study, resultant of the selected plan are described in Table 12.

Table 12 - Plan 4 Environmental and Social Well-Being Effects

Evaluation Parameter	Plan 4	
	Ransom Creek Channel Improvements (Local Protection)	
<u>Environmental</u>		
Air Quality	ST: Minor Adverse	
	LT: Not Significant	
Water Quality	ST: Moderate Adverse	
	LT: Moderate Adverse	
Benthos	ST: Major Adverse	
	LT: Moderate Adverse	
Fisheries	ST: Major Adverse	
	LT: Major Adverse	
Wildlife	ST: Major Adverse	
	LT: Moderate Adverse	
Vegetation	ST: Major Adverse	
	LT: Moderate Adverse	
Wetlands	ST: Not Significant	
	LT: Not Significant	
Threatened/Endangered/ Rare Species	ST: Not Significant	
	LT: Not Significant	
<u>Social Well-Being</u>		
Community and Regional Growth	ST: Minor Beneficial	
	LT: Moderate Beneficial	
Displacement of People	ST: Minor Adverse	
	LT: Minor Beneficial	
Displacement of Farms	ST: Minor Adverse	
	LT: Minor Adverse	
Business/Industry Employment/Income	ST: Minor Beneficial	
	LT: Minor Beneficial	
Recreation	ST: Minor Adverse	
	LT: Not Significant	
Public Facilities and Services	ST: Minor Adverse	
	LT: Minor Beneficial	
Property Values and Tax Revenues	ST: Minor Adverse	
	LT: Minor Beneficial	
Noise and Aesthetics	ST: Minor Adverse	
	LT: Minor Adverse	
Community Cohesion	ST: Minor Adverse	
	LT: Minor Beneficial	
Cultural Resources	ST: Minor Adverse	
	LT: Not Significant	
<hr/>		
<u>Key:</u>	<u>Range:</u>	
ST: Short Term	Major Beneficial	Minor Adverse
LT: Long Term	Moderate Beneficial	Moderate Adverse
	Minor Beneficial	Major Adverse
	Not Significant	

PLAN IMPLEMENTATION

Ability to Pay - A test of non-Federal interests ability to pay for flood control projects was conducted based on rules presented in the Federal Register on September 23, 1987. The test is a two-step process which includes a benefits test and an income test. This test was conducted for the tentatively selected plan.

In Step 1, an alternative level of cost-sharing is determined by comparing project flood control benefits to project flood control costs. If this calculation yields an alternative non-Federal cost-share that exceeds the normal share (as defined in Section 103 of the Water Resources Development Act of 1986), the non-Federal interest will be required to provide the normal share. The minimal share for this project is 25 percent. For the Step 1 calculation, the benefit-cost ratio is divided by 4 and converted to a percentage. Since the project benefits are 100 percent flood control, the resulting percentage is 40 percent. Therefore, since the 40 percent exceeds the minimal share, the non-Federal interests will be required to provide the minimal share.

In Step 2, per capita incomes of the State and County in which the project is located are used to calculate an eligibility factor which determines whether a community is eligible for a full or partial reduction in cost-sharing as determined in Step 1. However, in this case, since Step 1 determined that the non-Federal interests pay the normal share, Step 2 is not necessary.

COST APPORTIONMENT

In accordance with the provisions of the Water Resources Development Act of 1986 (P.L. 99-662), non-Federal interests are required to provide a minimum of 25 percent of total construction costs. The value of lands, easements, rights-of-way, relocation and disposal areas (LERRD) required for the project is credited toward the required 25 percent. To receive credit for the required real estate, the local sponsor must obtain an appraisal approved by the government. However, the local sponsor must make a cash contribution of not less than 5 percent of the total cost of construction, regardless of the value of real estate interests and necessary relocations. Cost apportionment between Federal and non-Federal interests is presented in Table 13.

Table 13 - Construction Cost Apportionment
(October 1989 Price Levels)

Selected Plan	Federal	Non-Federal	Total
	\$	\$	\$
Construction Cost	1,455,000		1,455,000
Lands, Easements, Rights-of-way, Relocation, and Disposal Areas	0	271,000	271,000
Cash Contribution		214,000	241,000
Cost Appropriation	1,455,000	485,000	1,940,000

LOCAL COOPERATION

In accordance with Section 221 of Public Law 91-611, as amended, and Section 103 of Public Law 99-662, prior to initiation of the project, non-Federal interests are required to enter into a written agreement obligating themselves to perform items of cooperation as required under the authorizing legislation, Section 103 of Public Law 99-662, and other public law and Corps of Engineers' regulations. The items of cooperation in brief are:

(1) Provide, without cost to the Government, during the period of construction, all lands, easements, rights-of-way, and utility (other than those portions which pass under or through the project structures) and facilitate alterations and relocations required for construction and maintenance of the project, regardless of their value.

(2) Make a cash payment of not less than 5 percent of total project costs during the period of construction, regardless of the value of the items in 1 above. If the value of the items in 1 above is less than 20 percent of total project costs, the sponsor shall, during the period of construction, make such additional cash payments as are necessary to bring its total contribution in cash and value of lands, easements, rights-of-way, and utility and facility alterations and relocations (other than those portions which pass under or through the project structures), to an amount equal to 24 percent of total project costs.

(3) Hold and save the Government free from all damages arising from the construction, operation, maintenance, and rehabilitation of the completed project, except for damages due to the fault of negligence of the Government or its Contractors.

(4) Operate, maintain, and rehabilitate the project upon completion in accordance with regulations or directions prescribed by the Secretary of the Army.

(5) provide, without cost to the United States, all relocations and alterations of buildings and utilities (other than those portions which pass under or through the project structures), highways, and highway bridges, railroads (other than railroad bridges and approaches), sewers, related and special facilities required for the construction of the project.

(6) Prevent encroachment on any of the flood protection structures, including ponding areas, and if ponding areas are impaired, provide substitute storage capacity or equivalent pump capacity promptly without cost to the United States.

(7) Prescribe and enforce regulations to prevent obstruction or encroachment on channels which would reduce their flood-carrying capacity or hinder maintenance and operation.

(8) Publicize flood plain information in the areas concerned and provide this information to the zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels, including ponding areas, provided by the project.

(9) Annually inform residents of the potential flood risks.

(10) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, approved January 2, 1971, in acquiring lands, easements, and rights-of-way for construction and subsequent operation and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

(11) Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, in connection with the construction, operation, and maintenance of the project.

INSTITUTIONAL REQUIREMENTS

In New York State, local cooperation for all Federal flood control projects is provided by the State of New York acting through the New York State Department of Environmental Conservation (NYSDEC). For plan implementation, the above items of local cooperation would be provided by NYSDEC.

SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

In order to characterize the resource base of the project area, information has been obtained from existing literature and coordination with those Federal, State, and local agencies charged with administering fish and wildlife resources, land use plans, and cultural resources.

Project coordination was carried out via letter, telephone, and meetings with agencies including:

- a. U.S. Department of the Interior - Fish and Wildlife Service;
- b. U.S. Environmental Protection Agency - Regional Office;
- c. U.S. Department of Agriculture - Soil Conservation Service;
- d. U.S. Federal Emergency Management Agency - Regional Office;
- e. New York State Department of Environmental Conservation (NYSDEC), State, Regional, and Wildlife Resource Center;
- f. New York State Department of Transportation (NYSDOT);
- g. New York State Department of Parks, Recreation, and Historic Preservation;
- h. State and Regional Planning Boards; and
- i. County and Town Planning and Engineering Departments.

Also, in June 1989 a series of three public workshops were held to inform the public regarding plans under consideration. Those meetings were sponsored by the Corps of Engineers, town of Clarence, and the town of Amherst. A similar agency public workshop was also held in June 1989, with many of the above listed agencies in attendance. All the workshops were used to elicit public views and comments.

Public views and comments have been limited to the regional plans that were examined. Although emphasis was placed during those workshops on regional plans, such as Plan 11, there were no expressions of support to go only with a local protection plan such as Plan 4. As Plan 4 is equivalent to the Ransom Creek Improvements and Erie Barge Canal Diversion portion of Plan 11, comments on those components of Plan 11 are considered relevant to Plan 4. Comments on those components of Plan 11 are primarily environmental issues dealing with aquatic and riparian habitat for NYSDEC Region 9 Fisheries Unit and the U.S. Fish and Wildlife (USFWS) Service, Cortland. NYSDEC has indicated its concern for the fisheries of Ransom Creek and similar concerns were viewed by USFWS. The following are the recommendations of USFWS:

1. The channelization construction activity in Ransom Creek from the Tonawanda Creek Road bridge to the Hopkins Road bridge be limited to one side only and follow existing channel alignment;
2. All clearing and snagging operations be limited and coordinated with the Service and the State determine the obstructions, debris, and vegetation to be removed;
3. That the cutoff channel be replanted with a selected mixture of grasses and legumes immediately following construction;

4. That a pilot channel be constructed in the bottom of the cutoff channel to enable fish to escape being stranded after flood waters have receded;

5. That to protect spawning fish species, no construction and maintenance operation be carried out between March 1 and June 1;

6. That all channel improvement operations be carried out using hand labor and hand tools wherever possible (clearing and snagging). The use of heavy machinery be restricted to the minimum size and amount necessary, and transit of machinery be limited;

7. That the timing and duration of excess flow releases to the Barge Canal be coordinated with the appropriate State fishery biologist;

8. That no woody debris, trash, or excavated material removed from the project sites be disposed of, or stockpiled, in waters or wetlands of the United States and that a detailed disposal plan be submitted for agency review prior to project implementation.

All of the above USFWS recommendations, as explained earlier in this report would be addressed by design/construction methods for project implementation with the exception of USFWS recommendation regarding the pilot channel. Additional study would be necessitated to determine if a pilot channel is needed.

On January 25, 1990, the New York State Department of Environmental Conservation held a meeting to discuss the flood control plans for the lower Tonawanda Creek developed by the U.S. Army Corps of Engineers (COE), Buffalo District. In attendance at the January 1990 meeting were Federal including COE, State, County, and Town representatives. Concerns focused on institutional issues and environmental impacts of using the Erie Barge Canal; concerns about low water crossings in Plan 11; concerns about disposal of excavated materials; concerns related to potential changes in the designated floodway for FEMA guidelines; concerns that Plan 3 was not considered further - though not economically justified; concern that the wetlands in Clarence were not given adequate attention for flood control; and in closing the meeting, NYSDEC gave indication that they may not be able to sign a "hold and save" clause with the COE because of the Erie Barge Canal component of the project and further that they could not support any project at that time.

By letter dated January 31, 1990, the New York State Department of Environmental Conservation indicated their concern regarding potential changes in the designated floodway, and neither they nor local governments were in a position to make a decision on a preferred plan.

DESIGNATION OF THE SELECTED PLAN

As previously discussed, the Draft Final Feasibility Report identified the NED Plan for the Lower Tonawanda Creek - the Ransom Creek Channel Improvement (Alternative Plan 4) - as the Tentatively Selected Plan. However, when all the advantages, disadvantages, and unresolved issues were considered, the potential local sponsor, the New York State Department of Environmental Conservation, requested that the study of flood damage reduction in the Lower Tonawanda Creek watershed be deferred until a final determination of possible changes in the flood plain in Amherst and Clarence is made by the Federal Emergency Agency. This, in conjunction with the knowledge that Plan 4 would provide a low level of flood protection (25-year) and probable institutional problems with use of the Barge Canal for diversion of flood waters, resulted in the Corps of Engineers selecting the "No-Action" (do nothing) Plan as the Selected Plan.

CONCLUSIONS

Based on the study process involving problem identification; statement of the objectives; formulation of the alternatives; and appraisal of the costs, benefits, and environmental impacts of the alternative solutions; the following conclusions are considered pertinent:

a. For Lower Tonawanda Creek.

All regional alternatives were eliminated during the planning process. This left the Ransom Creek Channel Improvement (Alternative Plan 4) as the best plan for accomplishing the objective of reducing flood damages in the Lower Tonawanda Creek watershed. However, when all the advantages, disadvantages, and unresolved issues were considered, the potential local sponsor, the New York State Department of Environmental Conservation (NYSDEC), requested that the study of flood damage reduction in the Lower Tonawanda Creek watershed be deferred until a final determination of possible changes in the flood plain in Amherst and Clarence is made by the Federal Emergency Management Agency. NYSDEC's decision not to support the only feasible plan of improvement at this time, coupled with the knowledge that Plan 4 would provide a low level of flood protection (25-year) and the probable institutional problems with using the New York State Barge Canal to divert flood flows from Tonawanda Creek lead the Corps to select the "No-Action" (do nothing) Plan and conclude that the study should be terminated. Since further study of Plan 4 could be made under the Continuing Authority of Section 205 of the 1948 Flood Control Act at a later date if State and local officials so desire, termination, in lieu of deferring the existing study authority, is preferred.

b. For Buffalo River.

On the Buffalo River, the impacts of shoaling within the navigation channel, except for those complicated by ice, were examined. However, the impacts examined were found insignificant and continued dredging for flood damage reduction purposes is not economically justified. Thus, it is concluded that further study of the Buffalo River should be terminated.

c. For the Buffalo Metropolitan Area Study.

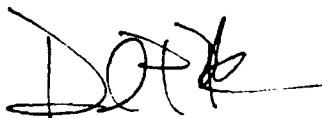
The study authority for the Buffalo Metropolitan Area study has been fully responded to, having addressed matters related to flood control, wastewater management, water supply, water quality, environmental quality, recreation, and fish and wildlife in the Buffalo River Basin, New York, including the Buffalo urban area. All actions under the Buffalo Metropolitan Area Study authority have been completed or can proceed under other available authorities such as Section 205 of the 1948 Flood Control Act for Plan 4 for Ransom Creek and maintenance authorities for maintaining the Black Rock Channel and Tonawanda Harbor. For these reasons, it is concluded that the Buffalo Metro study should be terminated.

RECOMMENDATIONS

The finding of this Feasibility Study is that further Federal participation in a flood damage reduction project for the Buffalo River/Lower Tonawanda Creek Watershed is not warranted at this time. Further, additional study under the Buffalo Metropolitan Area Study Authority is not warranted.

Therefore, I recommend the "No-Action" (do nothing) Plan as the recommended course of action for the Buffalo River and Lower Tonawanda Creek watersheds; that no further studies be conducted under the Buffalo Metropolitan Area Study Authority; and that the Buffalo Metropolitan Area Study Authority be terminated.

DATE: 4/4/91



David P. Plank
Major, U.S. Army
Acting District Commander

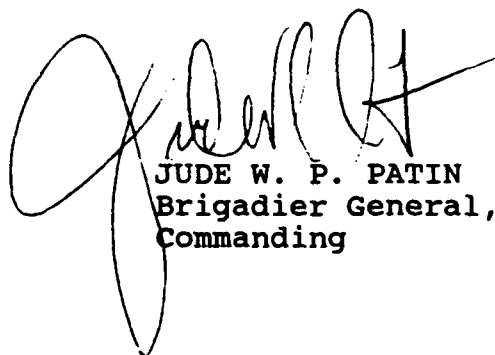
CENCD-PE-PD-PF (CENCB-PE-PF/April 1991) (1105) 1st End
Mr. Glanz/cld/(312) 353-3388
SUBJECT: Buffalo Metropolitan Area, New York, Water Resources
Management Study, Final Feasibility Report

Cdr, North Central Division, U.S. Army Corps of Engineers,
536 S. Clark St., Chicago, IL 60605-1592

22 APR 1991

FOR HQUSACE (CECW-P), WASH DC 20314-1000

1. Concur with the recommendation of the district commander.
2. The HQ, NCD, POC is Mr. Christopher K. Glanz, CENCD-PE-PD-PF, (312) 353-3388.



JUDE W. P. PATIN
Brigadier General, USA
Commanding

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233



Thomas C. Jorling
Commissioner

March 6, 1991

Major David P. Plank
Acting District Commander
Department of the Army
Buffalo District, Corps of Engineers
1775 Niagara Street
Buffalo, NY 14207-3199

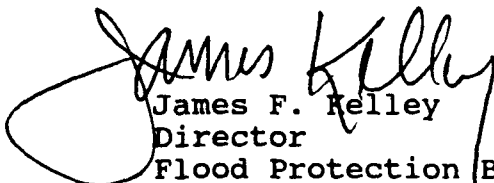
Attention: Wiener Cadet

Dear Major Plank:

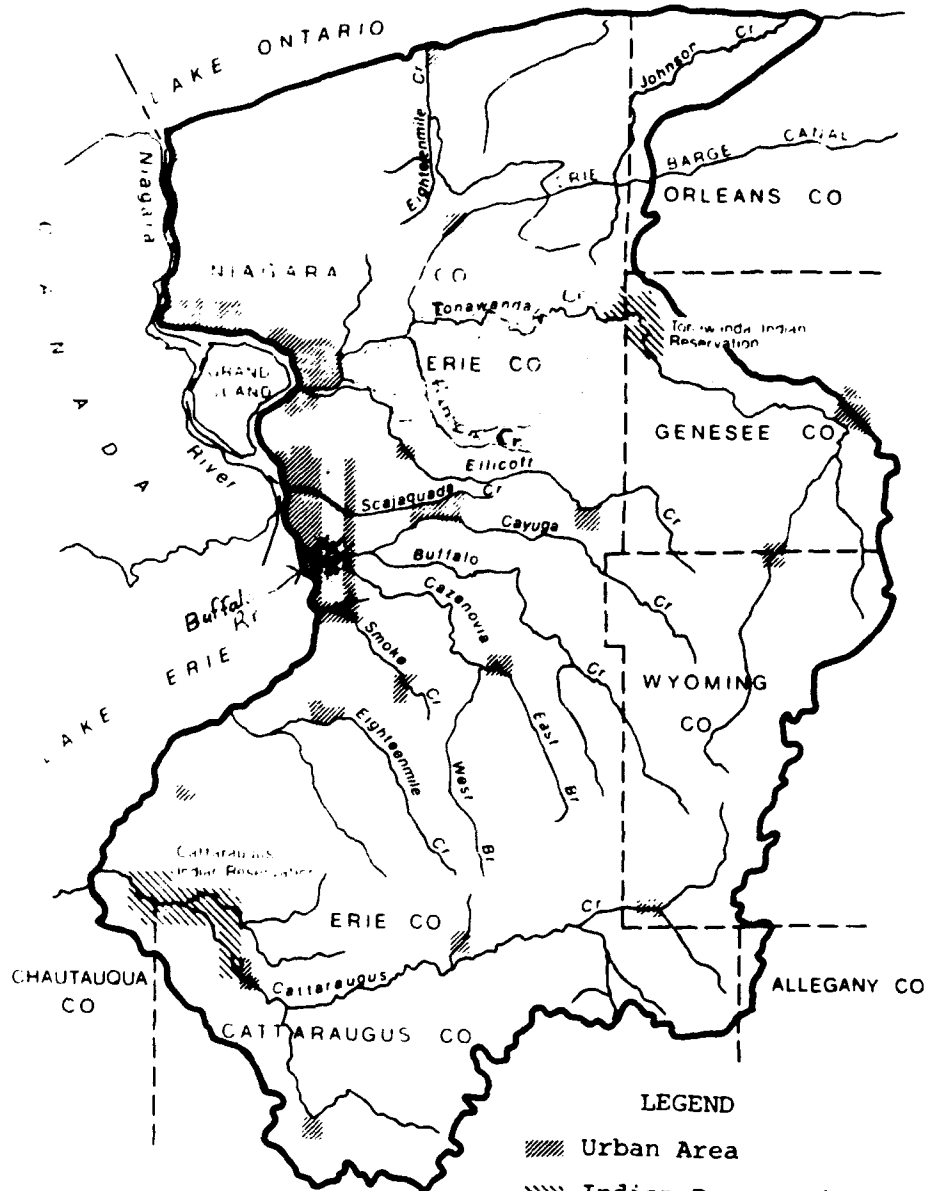
This is in response to your letter of January 10, 1991 to Commissioner Jorling transmitting a copy of the Draft Final Feasibility Report, Buffalo Metropolitan Area study. The State of New York concurs with the tentative finding that the study authority should be terminated.

The reason for the delay in responding to your letter is that no response was specifically requested. In the future when written response to correspondence is needed, please inform us.

Sincerely,

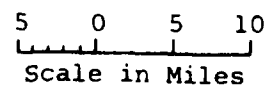

James F. Kelley
Director
Flood Protection Bureau

JFK:RLK:jb
cc: T. Myers



LEGEND

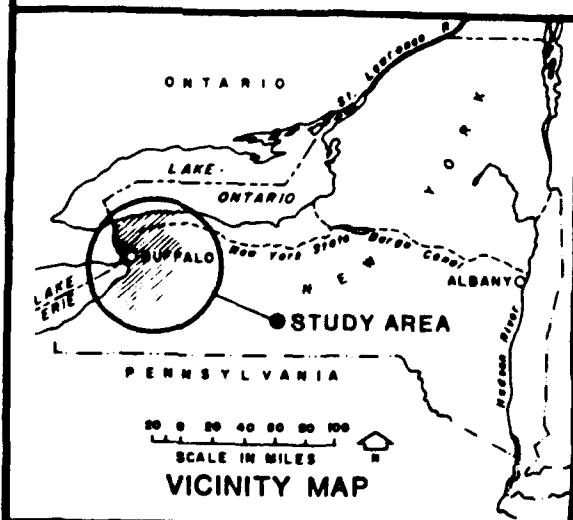
- Urban Area
- Indian Reservation
- Study Area



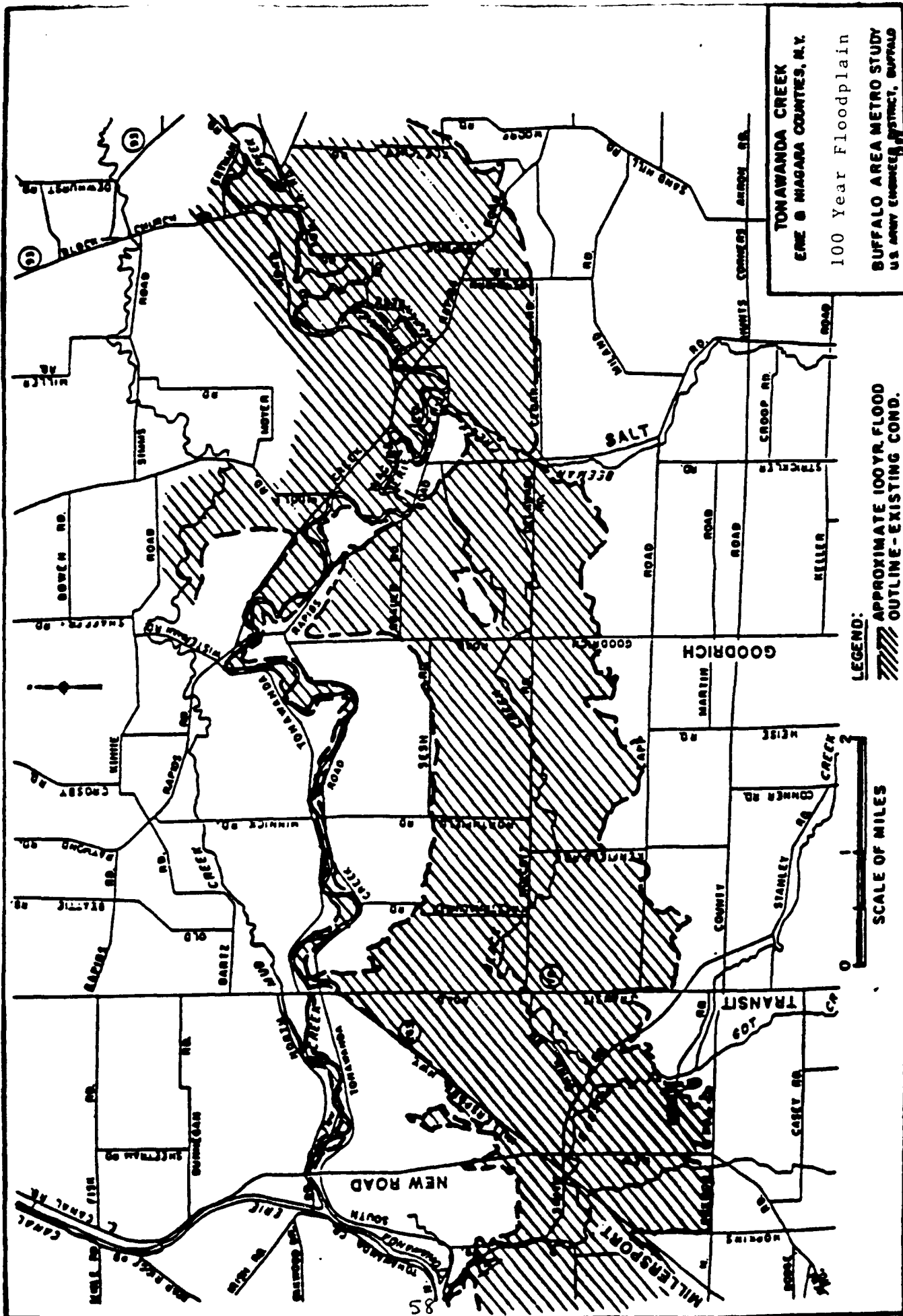
Buffalo Metropolitan Area - New York

BUFFALO METROPOLITAN STUDY AREA

US Army - Corps of Engineers - Buffalo District



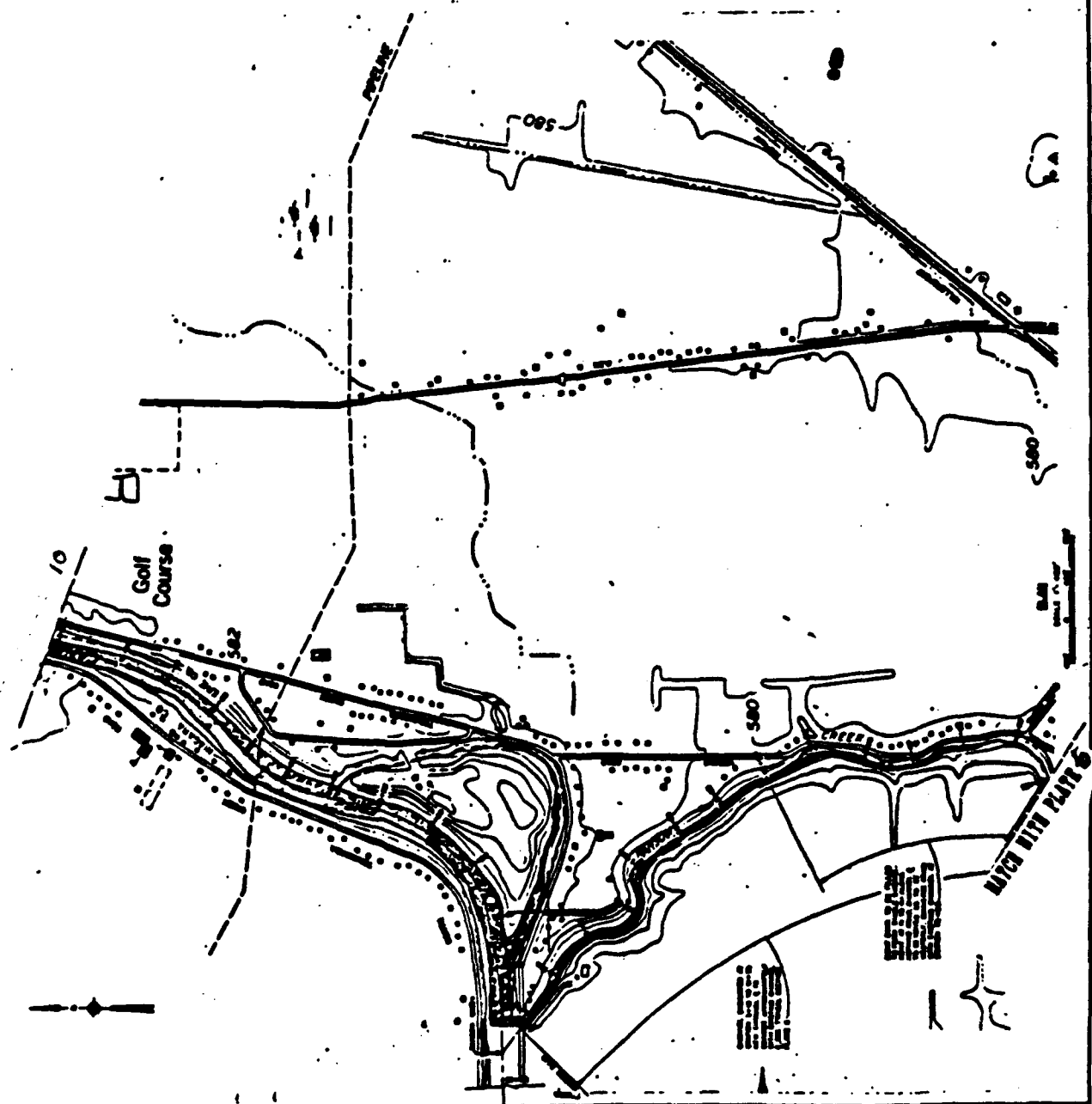
VICINITY MAP

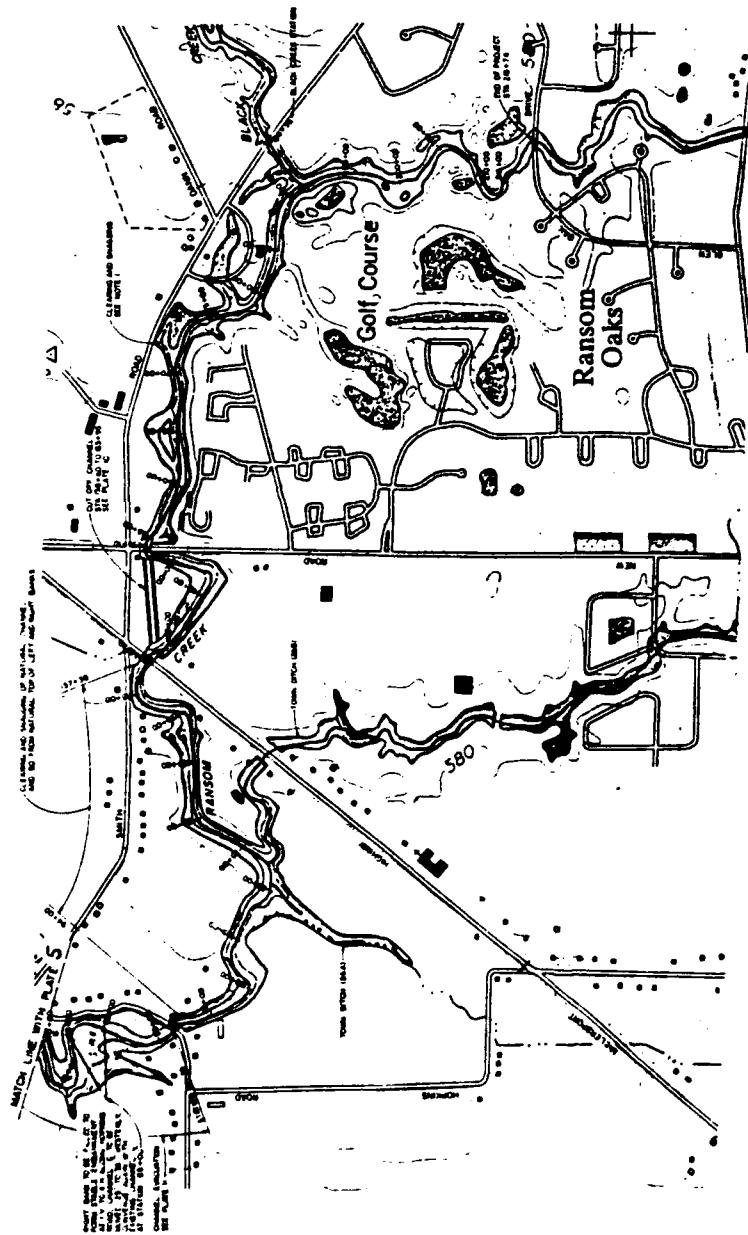


TONAWANDA CREEK
 ERIE & NIAGARA COUNTIES, N.Y.
 100 Year Floodplain
 BUFFALO AREA METRO STUDY
 U.S. ARMY ENGINEER DISTRICT, BUFFALO

LEGEND:
 HATCHED LINE: APPROXIMATE 100YR. FLOOD OUTLINE - EXISTING COND.

LOWER TOMAMANDA CREEK, NEW YORK
 PLAN 4
 U.S. ARMY ENGINEER DISTRICT BUFFALO
 OCTOBER 1955





NOTE:
 1. CLEANED AND REPAIRED TO ORIGINAL CONDITION, AND TO MATCH WITH PLATE 5.
 2. ROAD 100 FEET WIDE.
 3. MATCH LINE WITH PLATE 5.
 4. CLEANED AND REPAIRED TO ORIGINAL CONDITION AND TO MATCH WITH PLATE 5.
 5. ROAD 100 FEET WIDE.

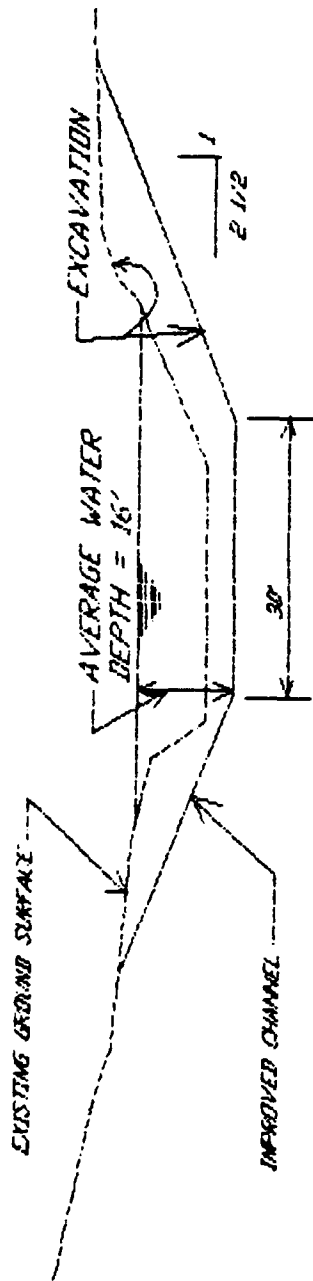
LOWER TONNAWAGA CREEK, NEW YORK

PLAN 4

U.S. ARMY ENGINEER DISTRICT BUFFALO
 OCTOBER 1965

PLAN
 SCALE 1" = 100'

PLATE 6



TYPICAL SECTION

RANSOM CREEK CHANNEL IMPROVEMENTS

FROM TONAWANDA CREEK RD (STA. 3+10) TO HOPKINS RD. (STA. 91+39)

LOWER TONAWANDA CREEK

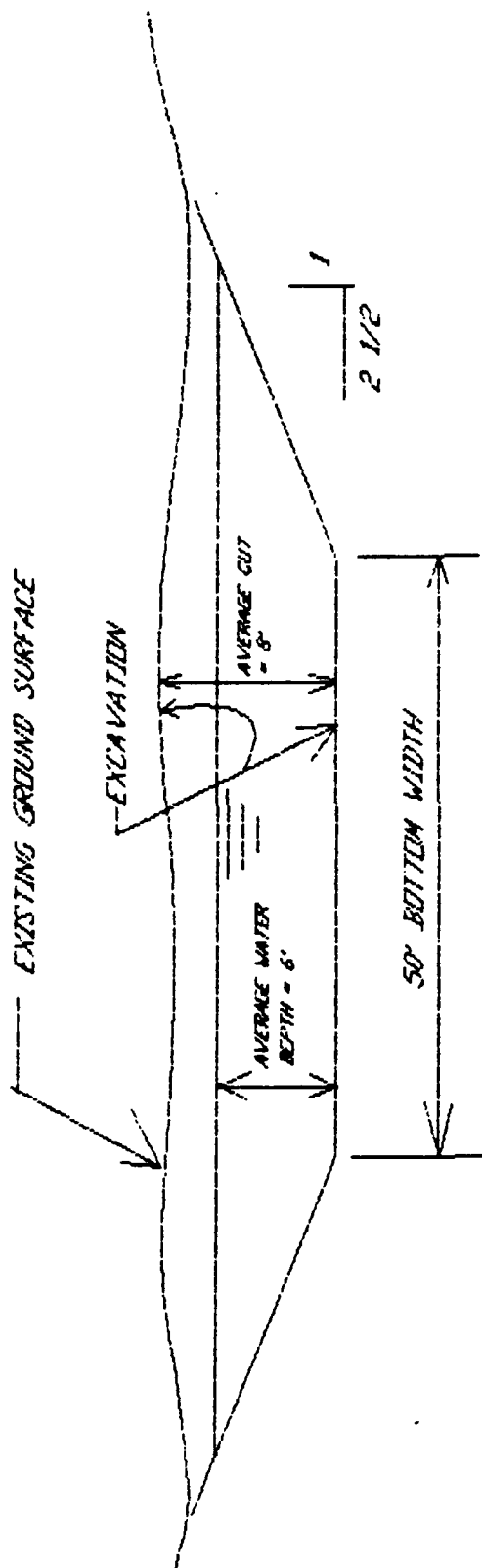
NEW YORK

PLAN 11

US ARMY ENGINEER
DISTRICT, BUFFALO

OCTOBER 1989

PLATE 7



TYPICAL SECTION

RANSOM CREEK CUT-OFF CHANNEL

CONFLUENCE STATIONS - 138+60 & 153+95

CHANNEL LENGTH = 800'±

LOWER TONAWANDA CREEK

NEW YORK

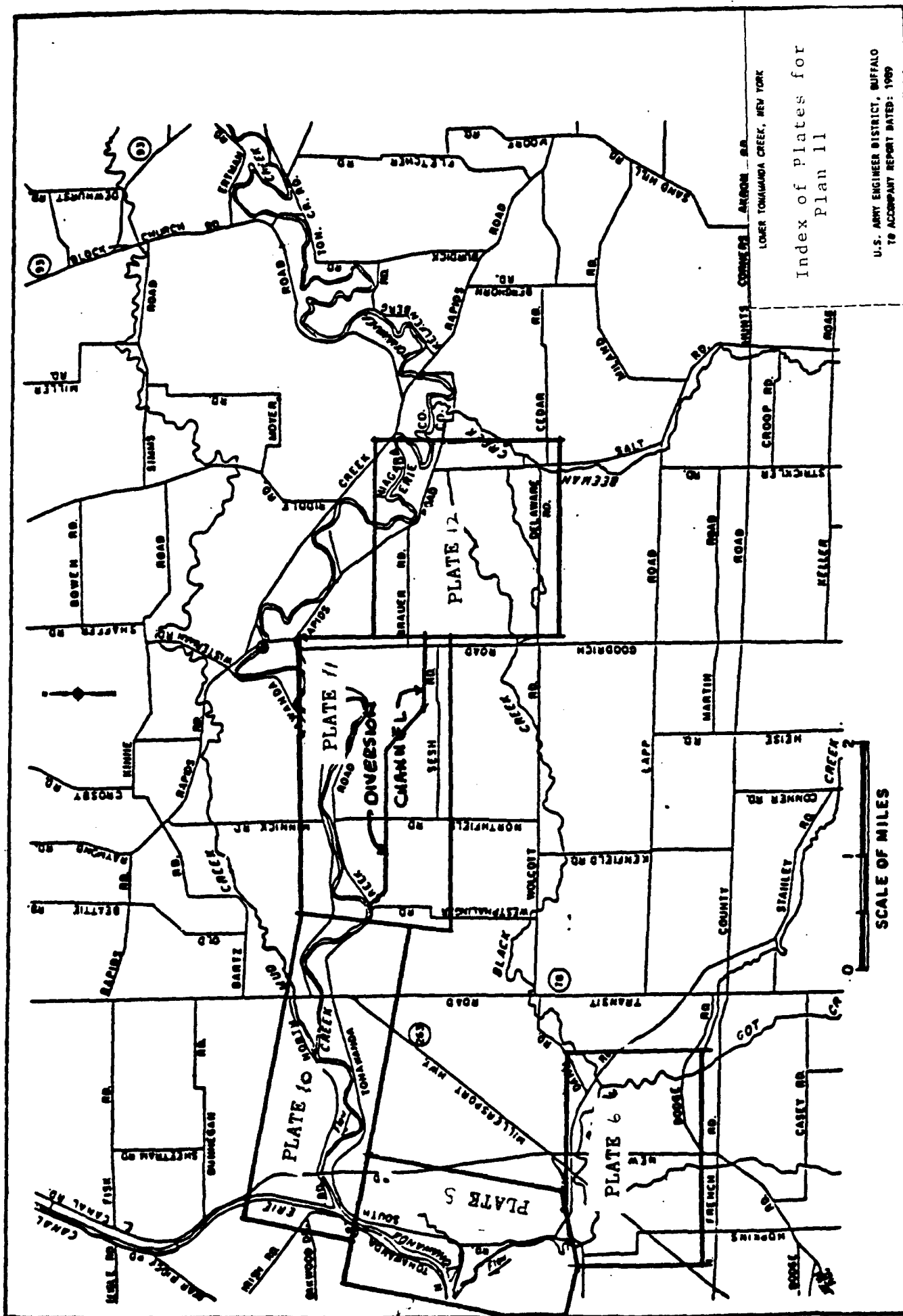
PLAN 11

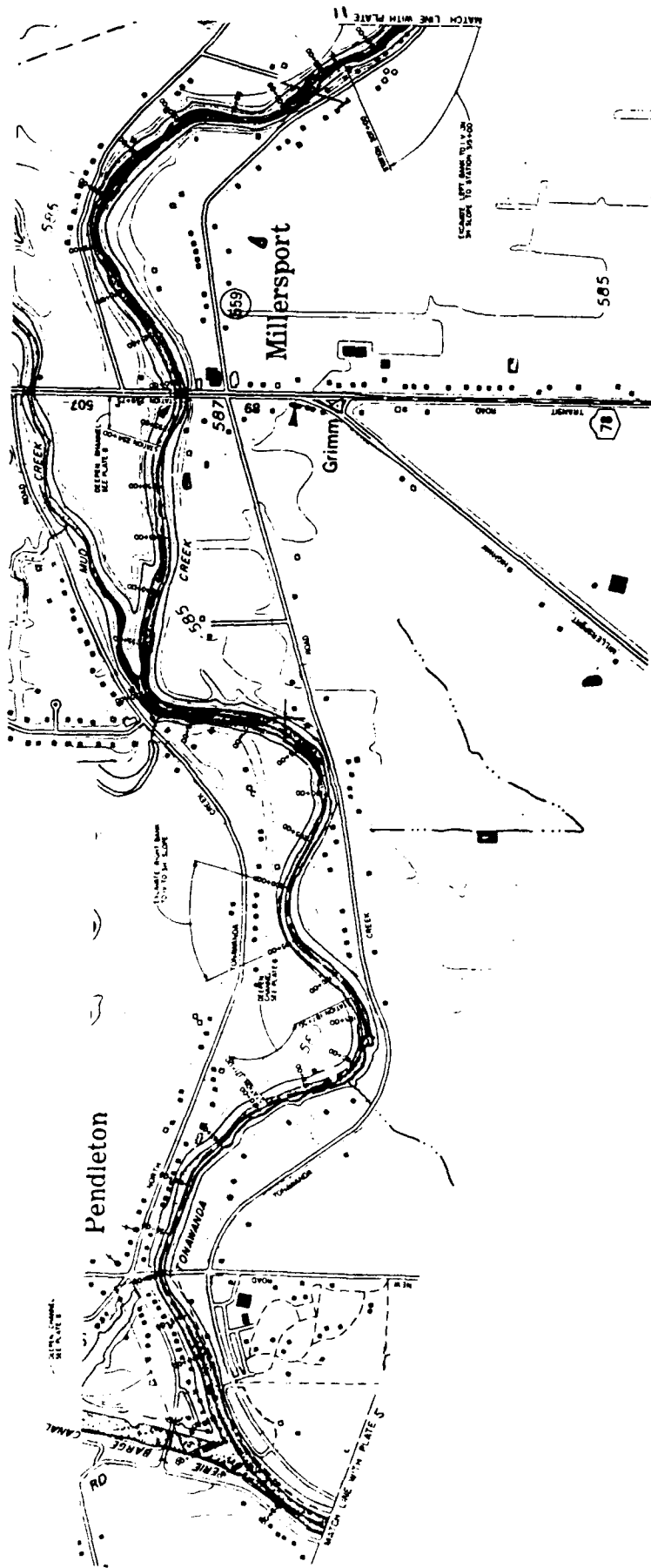
US ARMY ENGINEER

DISTRICT, BUFFALO

OCTOBER 1989

PLATE 8'

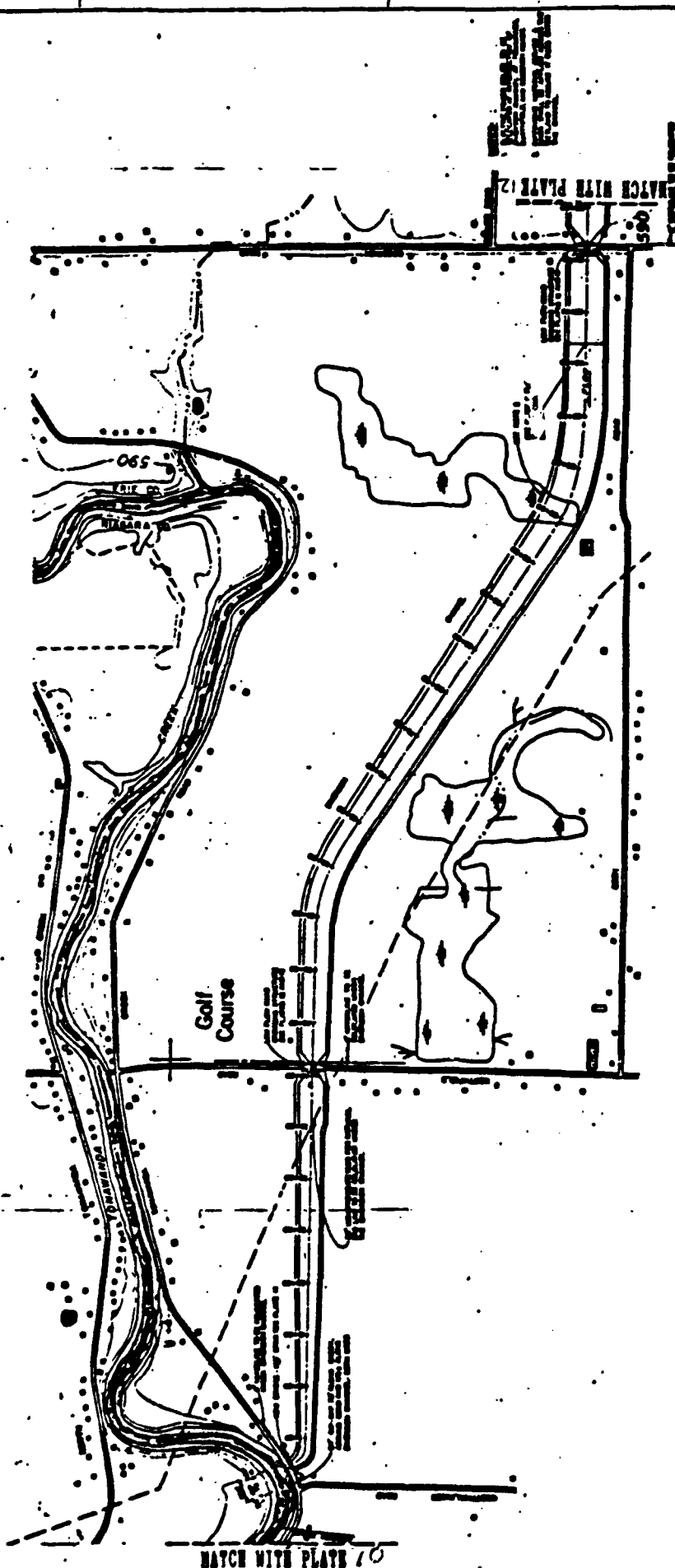




LOWER TONAWANDA CREEK, NEW YORK

PLAN II

U.S. ARMY ENGINEER DISTRICT BUFFALO
OCTOBER 1949

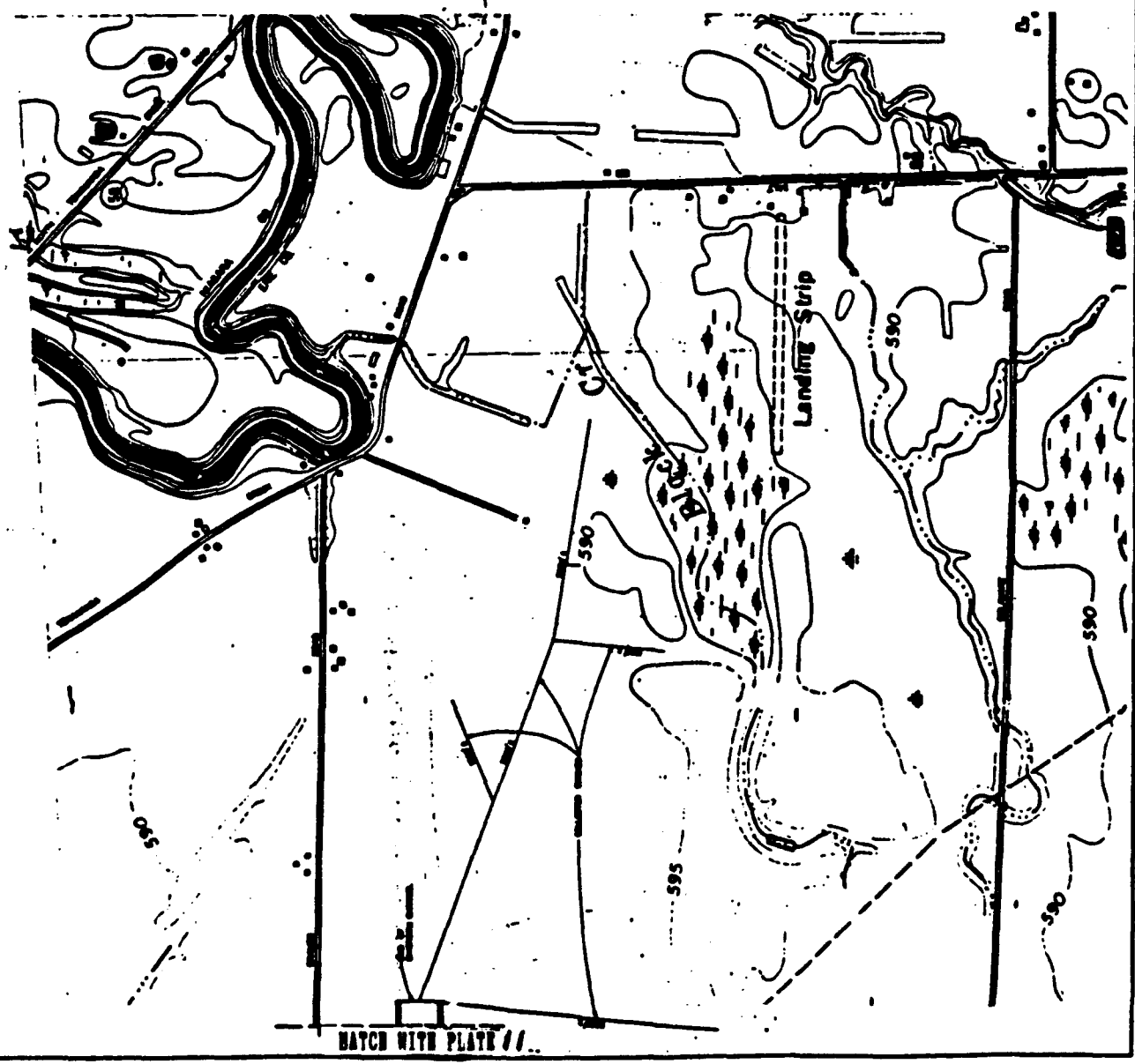


1:50,000 SCALE, 1950
 PLAN 11
 U.S. ARMY ENGINEERING CORPS
 CORPUS CITY, TEXAS

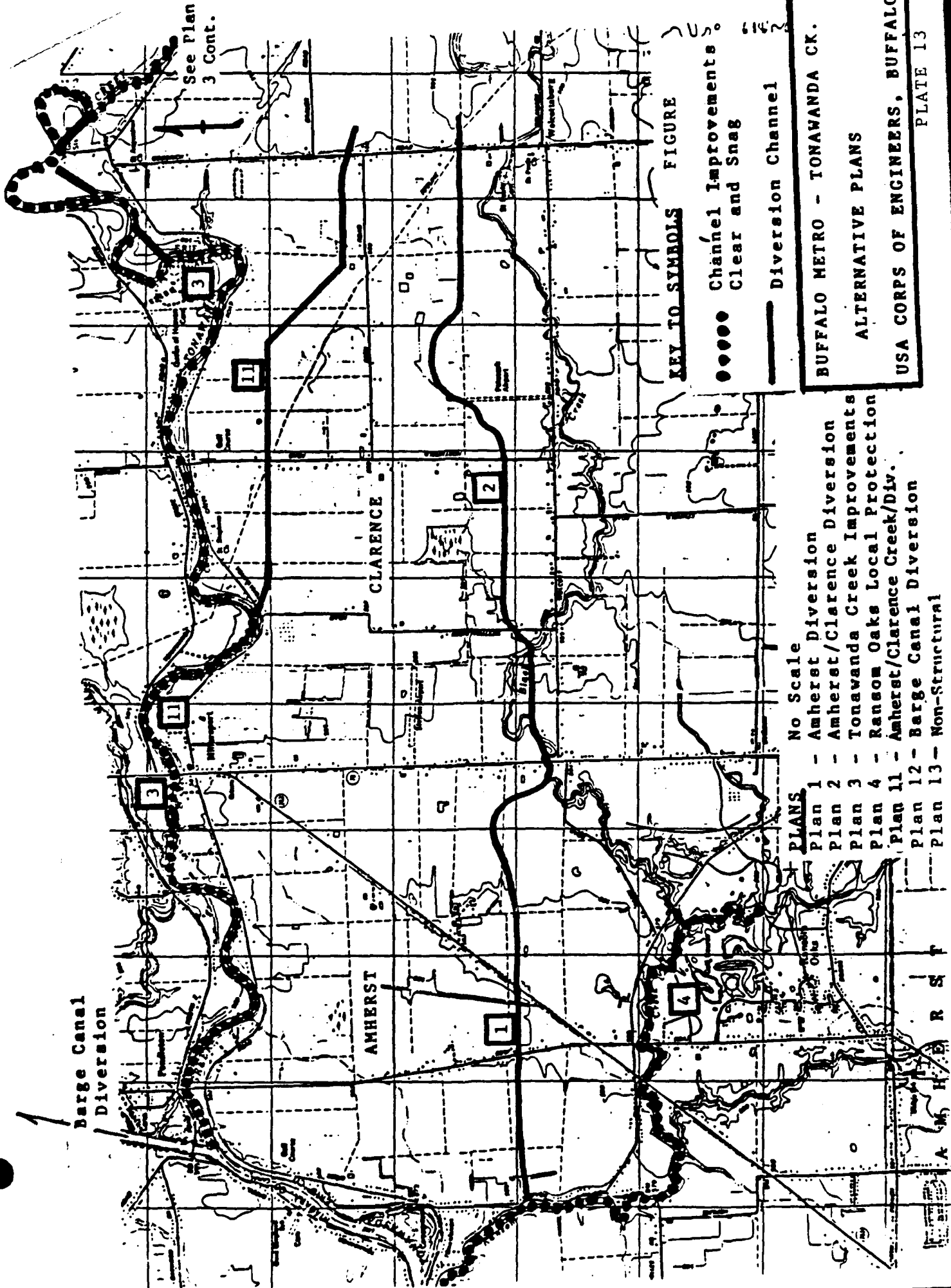


LOWER TOWNSHIPS CREEK, NEW YORK
PLAN II
U.S. NAVY ENGINEERING OFFICE
CHICAGO, ILL.

Scale
1:50,000



MATCH WITH PLATE 11



See Plan
3 Cont.

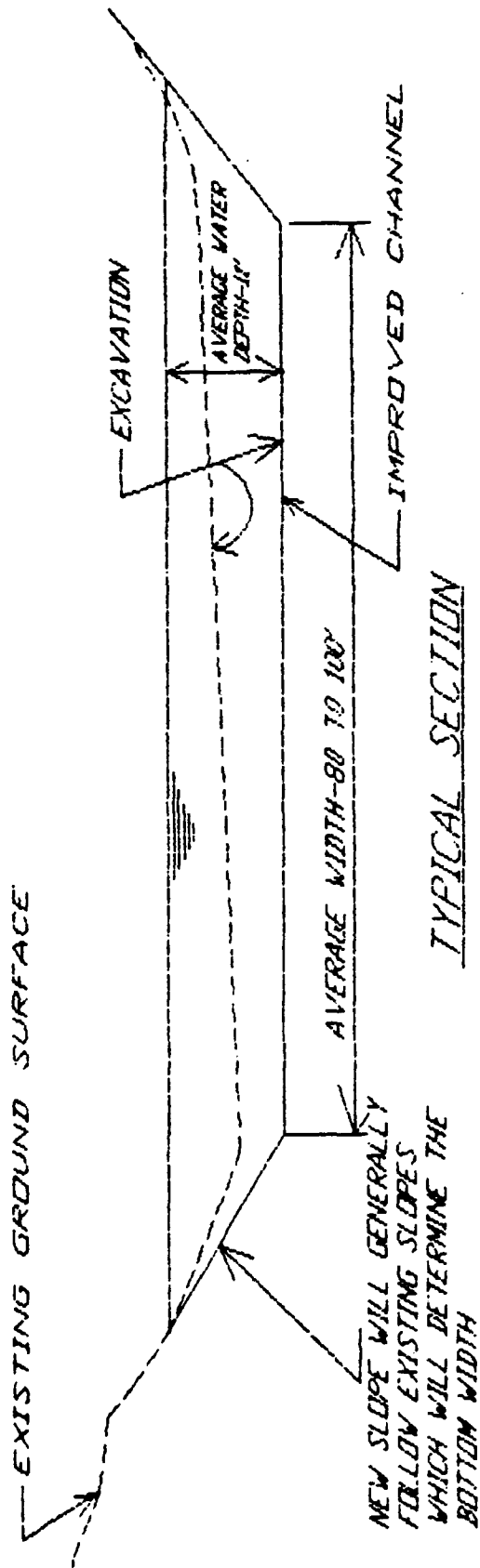
KEY TO SYMBOLS

- Channel Improvements
Clear and Snag
- Diversion Channel

- PLANS
- Plan 1 - Amherst Diversion
 - Plan 2 - Amherst/Clarence Diversion
 - Plan 3 - Tonawanda Creek Improvements
 - Plan 4 - Ransom Oaks Local Protection
 - Plan 11 - Amherst/Clarence Creek/Div.
 - Plan 12 - Barge Canal Diversion
 - Plan 13 - Non-Structural

No Scale

BUFFALO METRO - TONAWANDA CK.
 ALTERNATIVE PLANS
 USA CORPS OF ENGINEERS, BUFFALO
 PLATE 13



TYPICAL SECTION

TONAWANDA CREEK CHANNEL IMPROVEMENTS

STATIONS 134+00 TO 150+00, 171+00 TO 187+50, 254+00 TO 259+75

440 CURVE YARDS TO BE REMOVED

LOWER TONAWANDA CREEK

NEW YORK

PLAN II

US ARMY ENGINEER
DISTRICT, BUFFALO

OCTOBER 1989

PLATE 15

EXISTING GROUND SURFACE

EXCAVATION

AVERAGE WATER
DEPTH = 9'

AVERAGE DEPTH

LOWER 1/3 = 12' ±
UPPER 2/3 = 8' ±

BOTTOM WIDTH VARIES FROM 350' AT INCEPTION
EAST OF GEDDRICH ROAD TO 65' AT THE CONFLUENCE
WITH TONAWANDA CREEK STATION 320+00

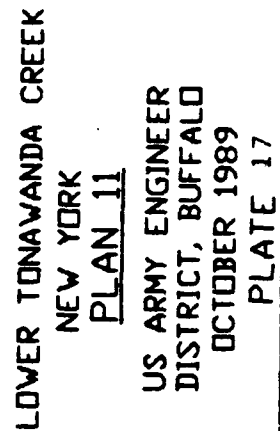
1
3

TYPICAL SECTION
TONAWANDA CREEK DIVERSION CHANNEL

LOWER TONAWANDA CREEK
NEW YORK
PLAN 11

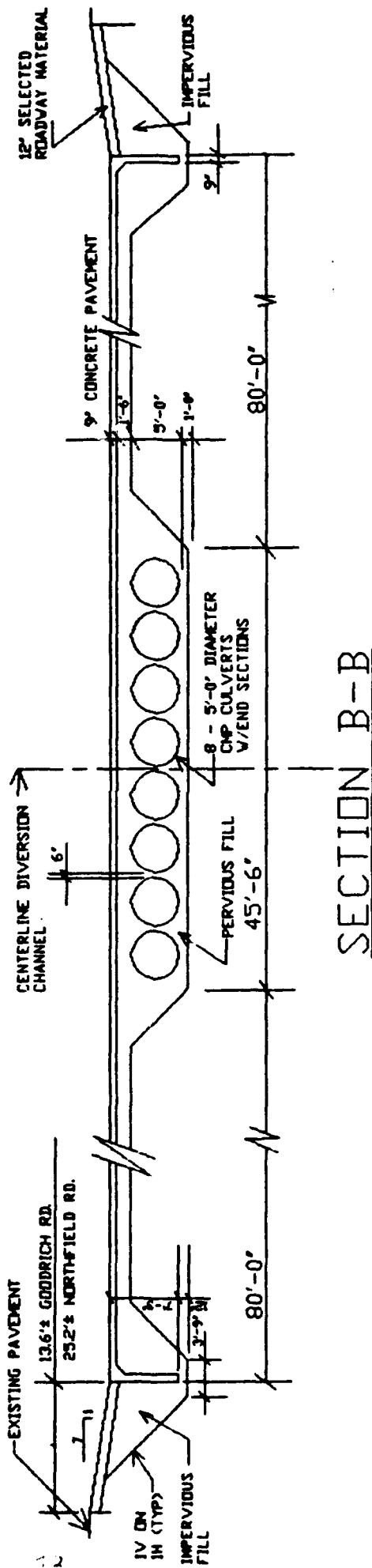
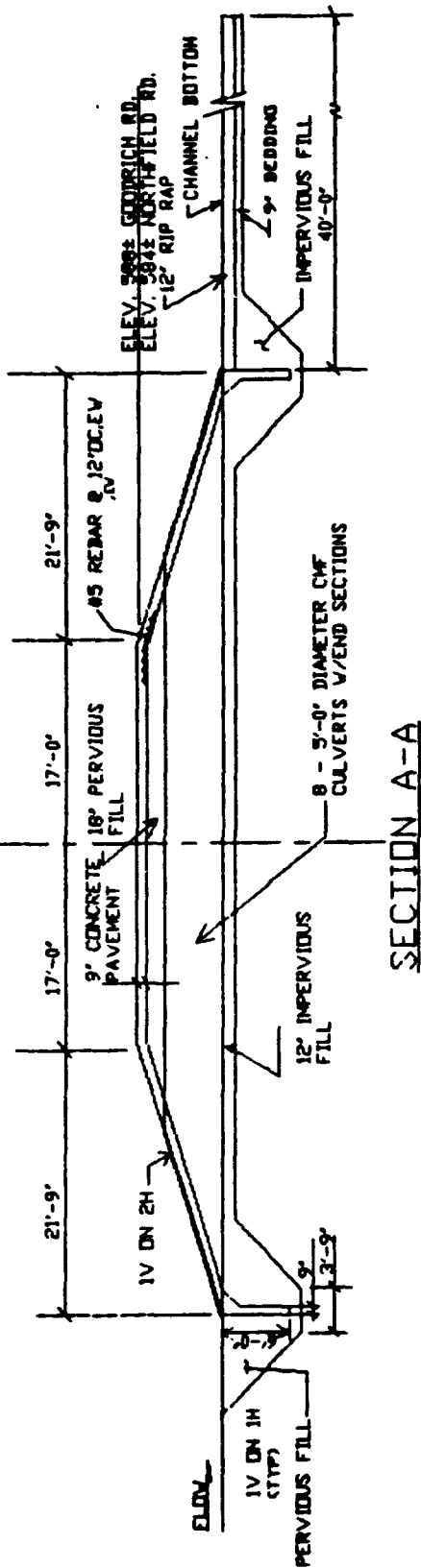
US ARMY ENGINEER
DISTRICT, BUFFALO
OCTOBER 1989

PLATE 16



LOW FLOW ROAD CROSSING STRUCTURE

CENTERLINE
GODDRICH ROAD &
NORTHFIELD ROAD



LOWER TONAWANDA CREEK

NEW YORK

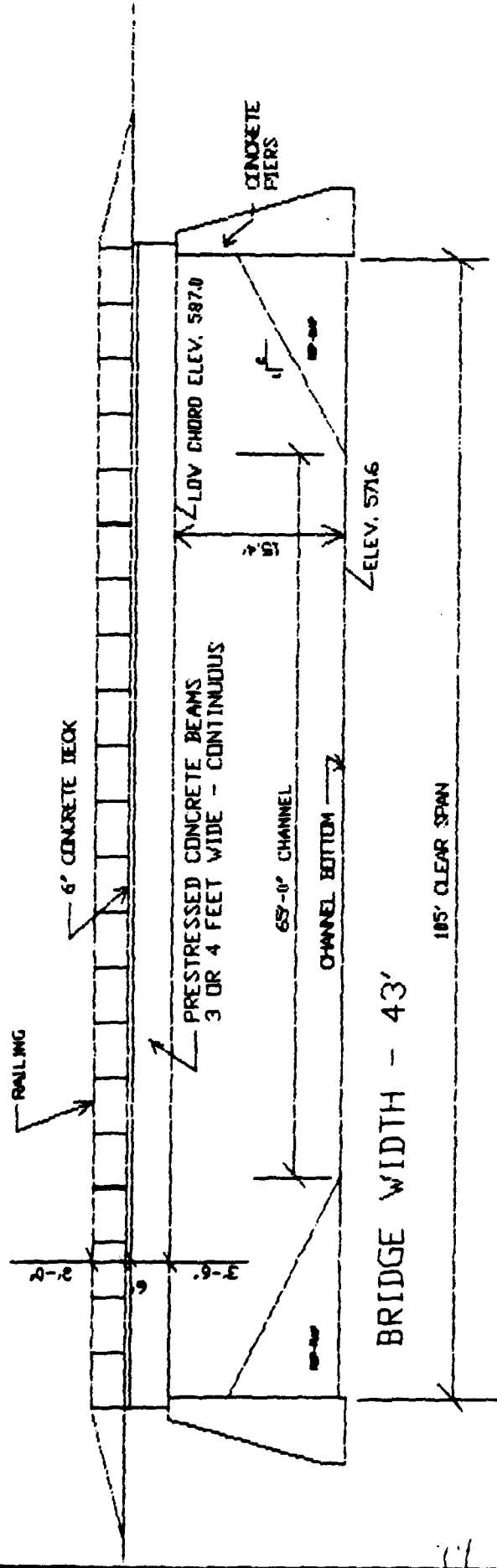
PLAN 11

US ARMY ENGINEER

DISTRICT, BUFFALO

OCTOBER 1989

PLATE 18



PROPOSED TONAWANDA CREEK BRIDGE

CROSS SECTION

LOWER TONAWANDA CREEK
 NEW YORK
PLAN 11
 US ARMY ENGINEER
 DISTRICT, BUFFALO
 OCTOBER 1989
 PLATE 19

PRELIMINARY

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Proposed Plan for Flood Damage Reduction
in the Lower Reaches of Tonawanda Creek
and Tributaries, Erie and Niagara Counties,
New York

The responsible lead agency is the U.S. Army Corps of Engineers, Buffalo, District. The responsible cooperating agency is the New York State Department of Environmental Conservation.

ABSTRACT: Flooding is a periodic problem in the lower reaches of Tonawanda Creek the main stem of which serves as the boundary between Erie and Niagara Counties, New York. The Buffalo District has investigated public concerns of flooding in this vicinity and various potential alternative flood damage reduction measures. Of thirteen plans initially considered, two were selected for detailed study. Plan 4 consisting of channelization measures along Ransom Creek would provide localized 100 year event level flood protection to the project vicinity major flood damage area (Ransom Oaks) from flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via overflow through Black Creek. Plan 11 consisting of some diversion down the Barge Canal, channelization measures along part of Tonawanda Creek, an overflow return flow diversion channel, and channelization measures along Ransom Creek would provide more regional 100 year event level flood protection along major damage areas of Tonawanda, Black, and Ransom Creeks. Plan 4 has been tentatively selected based on overall evaluation and its net positive contributions to the goals of National Economic Development consistent with Environmental Quality.

Send comments to the District Engineer by _____.

If you would like further information on this statement, please contact:

Mr. Tod Smith
U.S. Army Corps of Engineers, Buffalo
1776 Niagara Street
Buffalo, New York 14207
716-879-4173

NOTE: Information, displays, maps, etc. discussed in the Buffalo Metropolitan Study - Lower Tonawanda Creek Main Report are incorporated by reference in this Environmental Impact Statement (EIS).

SUMMARY

MAJOR CONCLUSIONS AND FINDINGS

Flooding is a periodic problem in the lower reaches of Tonawanda Creek, primarily in the towns of Amherst and Clarence. Basically, flood waters from Tonawanda Creek overflow the creek banks near Salt Road in Clarence, and then flow along Black and Ransom Creeks back into Tonawanda Creek; thus forming two highflow floodplain areas within the project area. Flood damages include those to residential, commercial, and public properties.

The U.S. Army Corps of Engineers, Buffalo District under the Buffalo Metropolitan Area Study Authority has investigated public concerns pertaining to flooding in the lower Tonawanda Creek vicinity and potential alternative measures for addressing those concerns.

Initially, a wide spectrum of plans including both non-structural and structural measures are considered. Plans are evaluated for engineering and economic feasibility and environmental and social acceptability, or for best satisfying project planning objectives.

The Federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning requirements.

In addition to the No Action (Without Project Conditions) alternative, thirteen alternative plans were developed and evaluated. Plan measures included flood proofing, relocation, channelization, diversions, and berms. Of the thirteen plans, only two met basic Federal feasibility criteria to warrant further evaluation. The two plans were Plan 4 - Local Ransom (Oaks) Creek Channel Modifications and Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion.

Plan 4 consists primarily of channelization measures along Ransom Creek which would provide localized 100 year event level flood protection to the project vicinity major flood damage area (Ransom Oaks) for flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via overflow through Black Creek.

Plan 11 consists of channel modifications along Tonawanda Creek from the area of the confluence with the Barge Canal to the area where Westphalanger Road intersects with Tonawanda Creek Road. From this latter area a diversion channel would be constructed southeasterly to the area where Sesh Road intersects Goodrich Road. (Note: Continued channel modifications along Tonawanda Creek (Plan 3) was not feasible because of restrictions due to developments and extremely unstable soil conditions in the upstream reaches of the project area which would require extensive modification measures with minimal beneficial return.) Basically, the diversion channel would catch the flood overflows from the upstream reaches of the project area and return them to the modified Tonawanda Creek channel diverting highflows from Black and Ransom

Creeks. Plan 11 includes some diversion of highflows down the Barge Canal and also incorporates Plan 4. Plan 11 would provide 100 year event level flood protection to the floodprone Tonawanda Creek, Black Creek, and Ransom Creek areas, generally west of Goodrich Road.

Summary Table A lists significant environmental evaluation parameters and anticipated impact indications for considered potential reasonable alternative plans. Reference the narratives in Table 2 - Comparative Impacts of Reasonable Alternatives in Section 2 - Alternatives, and Section 4 - Environmental Effects for further details.

Overall evaluation identifies Plan 4 - Local Ransom (Oaks) Creek Channel Modifications as the National Economic Development (NED) and recommended plan.

Major issues associated with Plan 4 pertained to: benefits and costs, level of flood protection, impacts to properties, impacts to aquatic and riparian resources, excavation/storage/disposal of material, diversion to the Erie Barge Canal.

Because of the scope of the project and the associated issues of concern, this environmental impact statement has been prepared for this study.

Efforts will be made to incorporate practical measures to avoid or minimize any adverse impacts due to project implementation. Environmental considerations include:

- ° Incorporation of environmental protection measures during construction to avoid or minimize adverse impacts to water and associated land resources such as noise, dust, pollution, turbidity, and erosion as prescribed by the Corps of Engineers Civil Works Construction Guide Specification entitled "Environmental Protection" (CW-01430 July 1978).

- ° Acquisition of properties in accordance with guidelines established by the "Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970," as amended.

- ° Scheduling considerations to avoid or minimize adverse impacts to area residents and fish and wildlife resources.

- ° Routing considerations to avoid or minimize adverse impacts to area roads and residents.

- ° Incorporation of alternate channelization measures, where practical, to avoid or minimize adverse impacts to fish and wildlife, properties, aesthetics, water tables, wetlands, and farmlands (i.e., alternate embankment channelization, highflow channel, alignments, diversion, channel dimension, slope of embankment, embankment protection, revegetation, etc.).

- ° Appropriate disposal of cleared and excavated material.

- ° Adequate drainage and erosion protection measures.
- ° Landscape and revegetation measures to avoid or minimize adverse impacts to aesthetics, erosion, and fish and wildlife.

AREAS OF CONTROVERSY

The project area is a suburban growth area for metropolitan Buffalo. Associated population growth and development is expected to continue for some time in the future. Development in floodplain areas is subject to National Flood Insurance Policy related regulations. Community development is a controversial issue in the project area. On the one hand, some argue for the benefits of development (primarily economic), while on the other hand, others argue for the retainment of open or rural areas for that quality of life. A flood control project could arguable alter community development patterns depending on its scope and level of protection possibly pertaining to feature (i.e., an undeveloped diversion floodway) but primarily by affecting floodplain areas and associated development regulations. For example, Plan 4 would provide localized and less than 100 year event level flood protection to the major flood damage area at Ransom Oaks. The 100 year event level floodplain would not be altered significantly, and associated flood plain regulations would remain. Plan 11 however, would provide more regional and 100 year event level flood protection significantly reducing the area 100 year event floodplain and associated floodplain regulations, conceivably opening more area for easier development (unless restricted by alternate means) increasing urban rural development conflict. It is arguable, however, that these lands would be equally subject to developmental pressure with or without the project. While non-floodplain areas would not require floodplain related flood protection measures (a cost), property values in non-floodplain areas are generally higher bringing developmental costs to relative equilibrium. and the controversy continues.

Representatives from the town of Clarence would like to have seen more done along Tonawanda Creek in the upstream reaches of the project area between Westphalanger Road and Salt Road (i.e., Plan 3). Extremely unstable soil conditions in this area, however, would require extensive channel modification requiring extensive relocations and channel erosion protection, pushing project costs far above benefits. Additional environmental concerns pertaining to impacts to aquatic and riparian resources also hindered such measures. The Plan 11 Clarence Diversion Channel, in effect replaces these measures.

Representatives from the town of Clarence also recommended that the Corps or the State investigate the use of existing and created wetland areas for limited flood control (less than 100 year event protection). Existing wetlands do this to some degree. Lack of sufficient reservoir storage to provide measurable degrees of protection, cost for additional lands and construction, and environmental concerns pertaining to impacts to wetlands (both not-enough and too-much water may damage wetlands) and farmlands, make this proposal unfeasible.

Acquisition of properties for project implementation is normally an area of some controversy. Acquisition of properties is accomplished in accordance with guidelines established by the "Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970," as amended.

UNRESOLVED ISSUES

Final Federal, State, and local cost sharing agreements will need to be made prior to preparation of project plans and specifications and subsequent construction. While Federal and State cost sharing options are fairly standard, State and local agreements are generally based on identified local benefits and costs.

Several other areas will likely require some additional study and coordination prior to finalization of these reports, preparation of plans and specifications, or project construction. These issues include:

- ° U.S. Fish and Wildlife Service - Coordination Act Report recommendation accommodations (environmental design measures or possible mitigation)

- ° Supplemental cultural resources investigation and potential mitigation measures.

- ° Supplemental important farmland impact assessment coordination.

- ° Supplemental disposal area and alternatives assessment.

- ° Lands, easements, right-of-ways (others)

- ° More detailed project design (other)

- ° *Eric Large Canal Diversion Impacts*

RELATIONSHIP TO ENVIRONMENTAL PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

The following table indicates the relationship of plans considered in detail to Federal and State environmental protection statutes, Executive Orders, and Memoranda. Reference Section 6 - Public Involvement and the Correspondence Appendix, also.

Summary Table A - Environmental Effect Indications

Evaluation Parameter	Plan 4	Plan 11
	Ransom Creek Modifications Local Ransom Oaks Protection	Tonawanda Creek Modifications and Clarence Diversion
Average Annual		
Cost		
Benefit		
B/C		
Net Benefits		
Air Quality	ST: Minor Adverse LT: Not Significant	ST: Moderate Adverse LT: Not Significant
Water Quality	ST: Moderate Adverse LT: Moderate Adverse	ST: Moderate Adverse LT: Moderate Adverse
Benthos	ST: Major Adverse LT: Moderate Adverse	ST: Major Adverse LT: Moderate Adverse
Fisheries	ST: Major Adverse LT: Major Adverse	ST: Major Adverse LT: Major Adverse
Wildlife	ST: Major Adverse LT: Moderate Adverse	ST: Major Adverse LT: Major Adverse
Vegetation	ST: Major Adverse LT: Moderate Adverse	ST: Major Adverse LT: Major Adverse
Wetlands	ST: Not Significant LT: Not Significant	ST: Major Adverse LT: Minor Adverse *
Threatened/Endangered/ Rare Species	ST: Not Significant LT: Not Significant	ST: Moderate Adverse LT: Moderate Adverse
Community and Regional Growth	ST: Minor Beneficial LT: Moderate Beneficial	ST: Minor Beneficial LT: Major Beneficial
Displacement of People	ST: Minor Adverse LT: Minor Beneficial	ST: Moderate Adverse LT: Moderate Beneficial
Displacement of Farms	ST: Minor Adverse LT: Minor Adverse	ST: Moderate Adverse LT: Moderate Adverse
Business/Industry Employment/Income	ST: Minor Beneficial LT: Minor Beneficial	ST: Moderate Beneficial LT: Moderate Beneficial
Recreation	ST: Minor Adverse LT: Not Significant	ST: Minor Adverse LT: Not Significant
Public Facilities and Services	ST: Minor Adverse LT: Minor Beneficial	ST: Minor Adverse LT: Moderate Beneficial
Property Values and Tax Revenues	ST: Minor Adverse LT: Minor Beneficial	ST: Moderate Adverse LT: Moderate Beneficial
Noise and Aesthetics	ST: Minor Adverse LT: Minor Adverse	ST: Moderate Adverse LT: Minor Adverse
Community Cohesion	ST: Minor Adverse LT: Minor Beneficial	ST: Moderate Adverse LT: Moderate Beneficial
Cultural Resources	ST: Minor Adverse LT: Not Significant	ST: Minor Adverse LT: Not Significant

Key:

ST: Short Term

LT: Long Term

Range:

Major Beneficial

Moderate Beneficial

Minor Beneficial

Not Significant

Minor Adverse

Moderate Adverse

Major Adverse

NOTE: Environmental Effects Indications prior to developed detailed environmental consideration measures.

* If appropriate engineering measures are taken to assure underground drainage would not be a problem by construction of the deep Clarence Diversion Channel.

Summary Table B - Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements for this Phase of Study

	Plan 4	Plan 11
<u>Federal Statutes</u>		
Archaeological and Historic Preservation Act, as amended, 16 USC 469, et seq.	Partial	Partial
National Historic Preservation Act, as amended, 16 USC 470a, et seq.	Partial	Partial
Fish and Wildlife Coordination Act, as amended, USC 661, et seq.	Partial	Partial
Endangered Species Act, as amended, 16 USC 1531, et seq.	Full	Partial
Clean Air Act, as amended, 42 USC 7401, et seq.	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 USC 1251, et seq.	Full	Full
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.	Full	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-11, et seq.	Full	Full
National Environmental Policy Act, as amended, 42 USC 4321, et seq.	Full	Full
Rivers and Harbors Act, 33 USC 401, et seq.	Full	Full
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.	N/A	N/A
Coastal Zone Management Act, as amended, 16 USC 1451, et seq.	N/A	N/A
Estuary Protection Act, 16 USC 1221, et seq.	N/A	N/A
Marine Protection, Research and Sanctuaries Act, 22 USC 1401, et seq.	N/A	N/A
Watershed Protection and Flood Prevention Act, 16 USC 1001, et seq.	Full	Full
Farmland Protection Policy Act, (7 USC 4201) et seq.	Partial	Partial
<u>Executive Orders, Memoranda, Etc.</u>		
Protection and Enhancement of the Cultural Environment (EO 11593)	Partial	Partial
Flood Plain Management (EO 11988)	Full	Full
Protection of Wetlands (EO 11990)	Full	Partial
Environmental Effects Abroad of Major Federal Actions (EO 12114)	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 Aug 76)	Partial	Partial
New York State Freshwater Wetlands Act (Wetlands >12.4 acres)	Full	Partial
New York State Environmental Conservation Law - Article 15 (Protection of Water)	Full	Full
Local Land Use Plans (See Flood Plain Management EO 11988, also)	Full	Full

The compliance categories used in this table were assigned based on the following definitions:

- a. Full Compliance - All requirements of the statute, EO, or other policy and related regulations have been met for this stage of the study.
- b. Partial Compliance - Some requirements of the statute, EO, or other policy and related regulations, which are normally met by this stage of planning, remain to be met.
- c. Noncompliance - None of the requirements of the statute, EO, or other policy and related regulations have been met.
- d. N/A - The statute, EO, or other policy and related regulations are not applicable for this study.

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

BUFFALO METROPOLITAN AREA STUDY
LOWER TONAWANDA CREEK
FLOOD DAMAGE REDUCTION FEASIBILITY STUDY
ERIE AND NIAGARA COUNTIES, NEW YORK

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SECTION 1 - NEED FOR AND OBJECTIONS OF THE ACTION

INTRODUCTION

1.01 This section briefly summarizes why the Corps became involved in the study and what public concerns and subsequent planning objectives were identified as the basis for plan formulation. Reference associated sections of the Main Report for more details on need for and objectives of the action.

STUDY AUTHORITY

1.02 This study is being conducted under the authority of the Buffalo Metropolitan Area Feasibility Study - Lower Tonawanda Creek.

PROBLEMS AND NEEDS

1.03 The project area is located in the lower reaches of Tonawanda Creek depicted on Figure 1. Flooding is a periodic problem in the project area. Basically, flood waters from Tonawanda Creek overflow the Creek banks at about Salt Road and then flow through Black and Ransom Creeks back into Tonawanda Creek; thus forming two highflow flood areas through the project area. Reference Figure 2 which represents about a 16,700 acre 100 year event floodplain. Major flood damage areas include those along Ransom and Black Creeks (Ransom Oaks) and along Tonawanda Creek in the area of Rapids. Damages include those to residential, commercial, and public properties.

1.04 The Buffalo District is investigating public concerns and potential alternative measures for addressing these concerns. Initially, a wide spectrum of both non-structural and structural measures are considered. They are examined alone and in combination for their: engineering and economic feasibility, environmental and social acceptability, and/or overall ability to meet the identified planning objectives.

PLANNING OBJECTIVES

1.05 The Federal objective of water and related land resources project planning is to contribute to National Economic Development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning requirements.

1.06 Planning objectives which were derived from resource management needs and utilized in plan formulation for the project vicinity include:

- a. To provide, where economically feasible, flood damage reduction measures for the existing floodprone community developments to preserve community economic and social well-being.
- b. To reduce - through flood damage reduction measures - health and safety hazards related to flooding in the project vicinity.
- c. To consider and to minimize any adverse impacts to other water resource interests.

d. To preserve where possible, the fish and wildlife resources (habitat) in the project vicinity, in order to protect natural environmental quality.

e. To preserve, as necessary, cultural resources in the project vicinity in order to protect cultural heritage.

f. To encourage good future land use practices consistent with national flood insurance and floodplain management policies to protect future community economic and social well-being and environmental quality.

BUFFALO METROPOLITAN STUDY AREA LOWER TONAWANDA CREEK

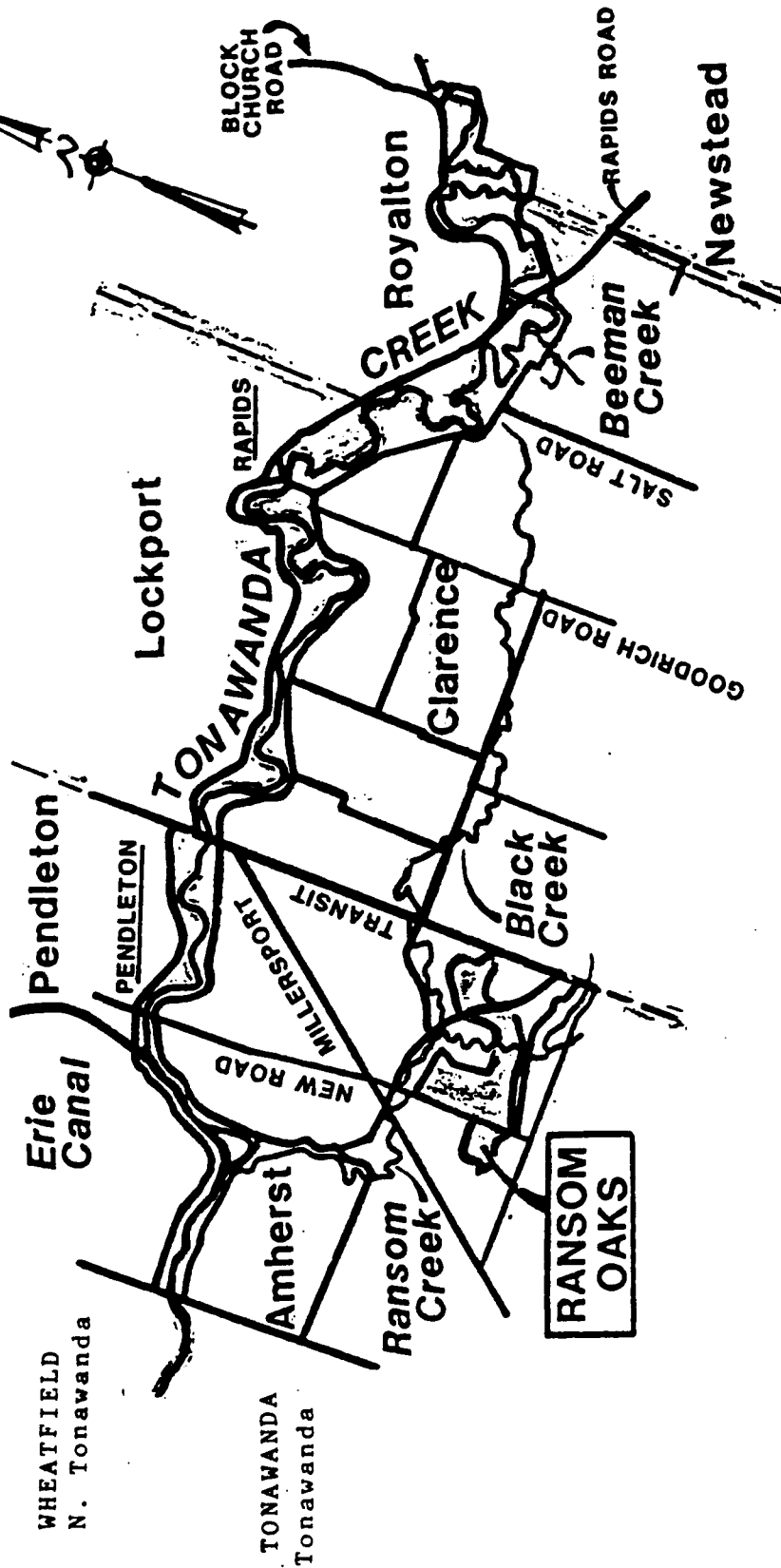
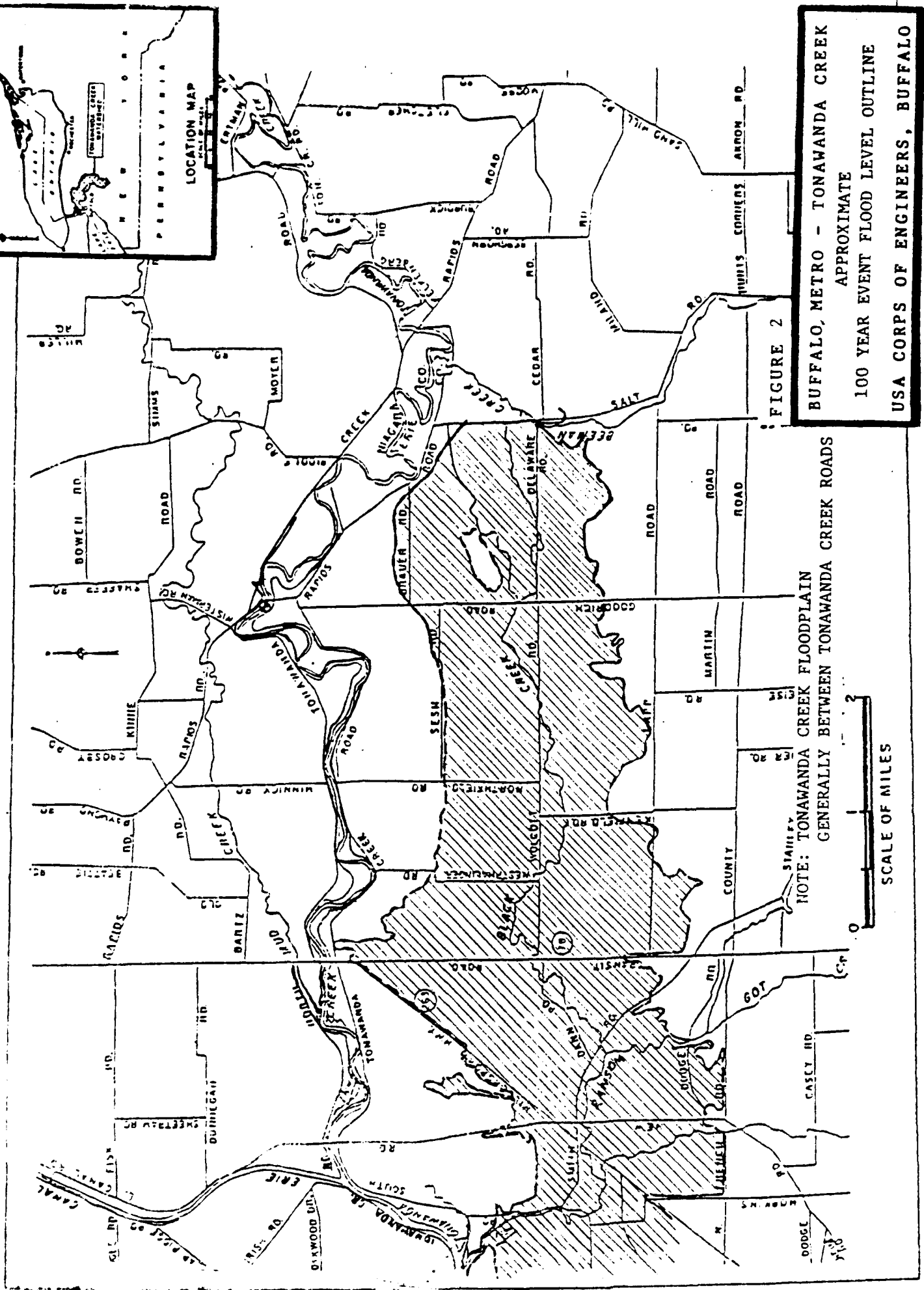
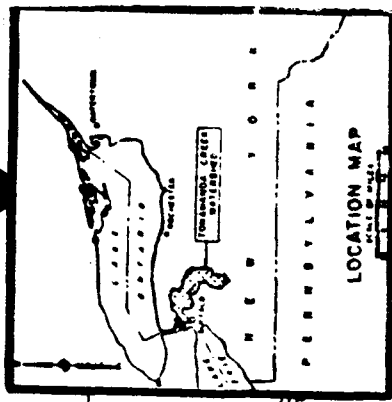


FIGURE 1
BUFFALO METRO - TONAWANDA CREEK
STUDY AREA
USA CORPS OF ENGINEERS, BUFFALO



NOTE: TONAWANDA CREEK FLOODPLAIN
GENERALLY BETWEEN TONAWANDA CREEK ROADS

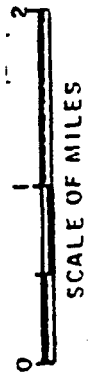


FIGURE 2

BUFFALO, METRO - TONAWANDA CREEK
APPROXIMATE
100 YEAR EVENT FLOOD LEVEL OUTLINE
USA CORPS OF ENGINEERS, BUFFALO

SECTION 2 - ALTERNATIVES

INTRODUCTION

2.01 This section identifies and briefly describes, alternatives considered, and the assessment and evaluation of the most reasonable alternatives. Reference associated section of the Main Report for more details on plan formulations.

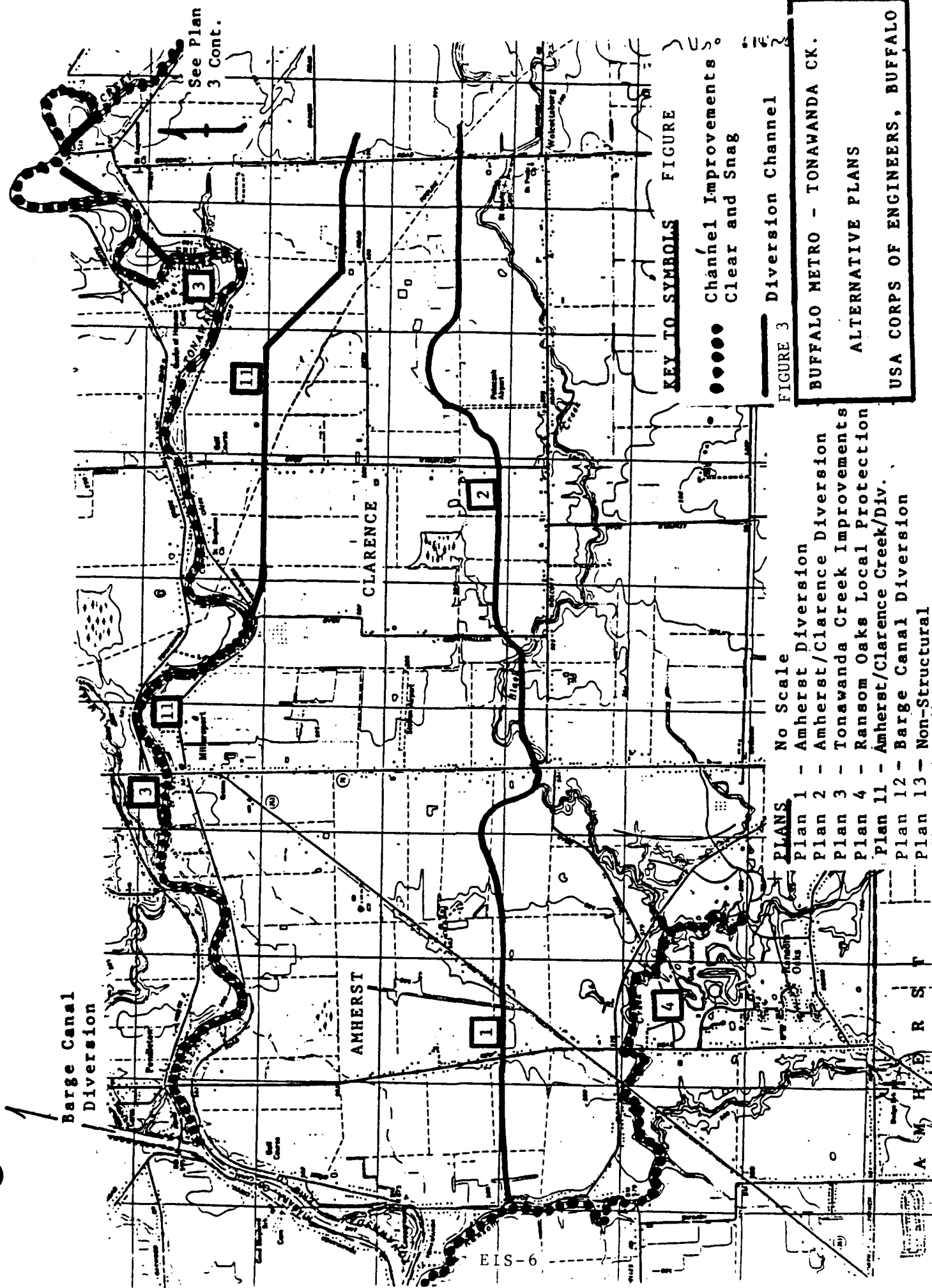
PLANS ELIMINATED FROM FURTHER STUDY

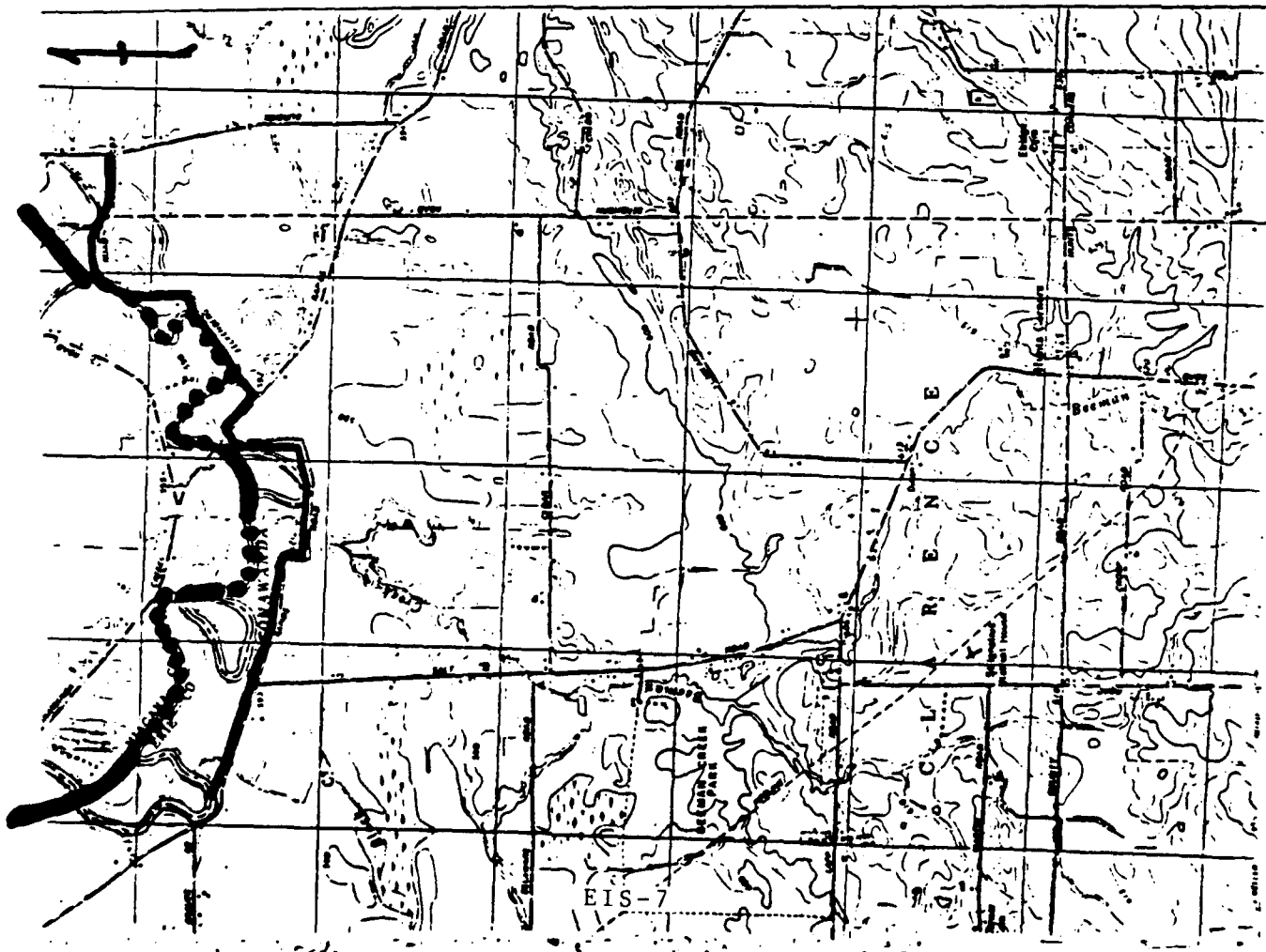
2.02 Initially, a number of potential flood damage reduction measures or possible combination of measures are considered and generally assessed and evaluated for engineering and economic feasibility and environmental and social acceptability or in best satisfying the project planning objectives in order to identify the most reasonable alternatives. Measures considered included: retention, clearing and snagging, channelization, diversion channels, floodwalls, levees or berms, in this case, non-structural diversion down the Barge Canal, and non-structural (flood insurance, floodwarning, floodproofing, relocation, floodplain management). From these measures, ultimately 13 alternative plans (excluding no-action without conditions) were developed for evaluation; listed as follows:

- Plan 1 - Amherst Diversion, Canal Diversion, 5,000 cfs
- Plan 2 - Amherst/Clarence Diversion, Canal Diversion, 5,000 cfs
- Plan 3 - Tonawanda Creek Improvements, Canal Diversion, 5,000 cfs
- Plan 4 - Local Protection Plan (Ransom Oaks), Canal Diversion, 3,000 cfs
- Plan 5 - Amherst Diversion, Canal Diversion, 2,500 cfs
- Plan 6 - Amherst/Clarence Diversion, Canal Diversion, 2,500 cfs
- Plan 7 - Tonawanda Creek Improvements, Canal Diversion, 2,500 cfs
- Plan 8 - Amherst Diversion, Canal Diversion, 0 cfs
- Plan 9 - Amherst/Clarence Diversion, Canal Diversion, 0 cfs
- Plan 10 - Tonawanda Creek Improvements, Canal Diversion, 0 cfs
- Plan 11 - Tonawanda Creek Improvements, Clarence Diversion, Canal Diversion, 3,000 cfs
- Plan 12 - Canal Diversion, 3,000 cfs
- Plan 13 - Non-Structural

2.03 As noticeable, plan sets (1,2,3), (5,6,7), and (8,9,10) are similar except for the amount of diversion discharge to the Barge Canal. Continued coordination and hydrologic and hydraulic investigations determined that the optimum diversion discharge to the Barge Canal is about 3,000 cfs; the optimum discharge allowed without disrupting the Canal integrity, operations, or environments. It was also determined that this diversion discharge in itself (Plan 12) would not significantly reduce flood damages in the project area. Therefore the number of considered plans for evaluation was effectively reduced to six (again excluding no-action without conditions); essentially Plans 1, 2, 3, 4, 11, and 13.

2.04 Without significant detail, basic features of Plans 1, 2, 3, 4, and 11 are depicted on Figures 3 and 4. Plan 13 is briefly described in the following paragraph.





No Scale

KEY TO SYMBOLS

FIGURE

Channel Improvements
Clear and Snag

Diversion Channel
Berm

FIGURE 4

BUFFALO METRO - TONAWANDA CK.

ALTERNATIVE PLANS - CONT.

USA CORPS OF ENGINEERS, BUFFALO

2.05 Plan 13 - Non-Structural. Nine different non-structural measures were initially considered in developing a non-structural plan for Tonawanda Creek. These measures ranged from installing check valves to relocating structures. The feasibility of each of these nine measures was evaluated for each structure considering the severity of flooding as well as site and building characteristics. Of the nine measures considered, three specific measures were identified as appropriate solutions to the flooding hazard: installation of check valves, closures, and sealants. The check valve measure involves installing check valves in individual sewerlines to prevent backup, closures involve sealing off low openings, and sealants involve completely sealing the exterior of the house to make it impervious to water.

2.06 These six basic plans were evaluated for basic engineering and economic feasibility and environmental and social acceptability. A general summary is provided in Table 1. Of the six basic plans evaluated, only Plans 4 and 11 warranted further investigation based on minimum Federal evaluation criteria. It was essentially determined that Plans 1, 2, 3, and 13 would not weather basic Federal economic, environmental, and/or implementation issues. Plan 4 appeared to be a potentially feasible localized protection plan while Plan 11 appeared to be a potentially feasible lower basin regional plan. These findings were presented at a June 26, 1989 public workshop.

2.07 Plan 3 was evaluated in some further detail at the request of the town of Clarence and residents. Basically they felt that improvements should be fully considered within the existing stream channel. As anticipated, however, the Plan 3 problems (significant soil stabilization problems), likely relocations, associated costs, and environmental concerns (aquatic, riparian, rare and threatened species) increasingly outweighed the Plan benefits.

2.08 Additionally, concerns were expressed about Plan 11, particularly pertaining to the Clarence Diversion Channel. The Clarence Diversion Channel essentially replaces the problem upstream modification features of Plan 3, but runs through an existing non-floodplain area and agricultural district in the town of Clarence. A more southerly route was briefly considered, but the increased length would increase cost and several more protected wetland areas would fall along that alignment.

2.09 A shorter diversion channel between Tonawanda Creek in the vicinity just west of Goodrich Road and the vicinity just south of Brauer Road was also briefly considered. Required channel modifications along Tonawanda Creek between this confluence and the Plan 11 confluence area would be extensive requiring extensive excavation and relocation of homes, roads, and utilities making this costly and impractical. Additionally continued channelization along Tonawanda Creek would heighten environmental concerns pertaining to disruption of aquatic and riparian and possibly rare and endangered species habitat.

2.10 The town of Clarence and residents, also recommended consideration of a smaller scale project involving use of wetlands and wetland creation to provide limited flood protection and environmental enhancement. Use of the Beeman Park wetland areas were mentioned. It was determined, however, that storage capacity needs would be substantial (basically a reservoir plan) and not

BUFFALO METROPOLITAN AREA STUDY

TABLE 1 - Evaluation, and Comparison of Alternative Plans

Item	Plan 1 Asbestos Diversion	Plan 2 Asbestos/Clarence Diversion	Plan 3 Tonawanda Creek Improvements	Plan 4 Ransom Oaks Local Protection	Plan 11 Tonawanda Creek Improvements and Clarence Diversion	Plan 13 Nonstructural Plan
Plan Description	Plan 1 consists of a diversion channel through the Ransom-Black Creek watershed, channel modification to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 14,570 feet of the diversion channel will run from Ransom Creek to about 100 feet west of Westphalinger Road with the western side of the Erie Barge Canal. The 28,935 feet of new diversion channel will run from a point 12,920 feet upstream, having a bottom width of 100 feet with IV:3H side slopes. Then the channel would have an average bottom width to a 120-foot depth of 13 feet, and have a system of side slopes and extend eastward at its upstream end, a system of collector ditches. The channel will require new bridges at Westphalinger Road, New Road, and Millersport Highway and reconstruction of the Transit Road Bridge.	Plan 2 involves construction of a diversion channel through the Ransom-Black Creek watershed similar to Plan 1, although considerably longer. Channel improvements and modifications to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 28,935 feet of new diversion channel will run from a point 12,920 feet upstream, having a bottom width of 100 feet with IV:3H side slopes. Then the channel would have an average bottom width to a 120-foot depth of 13 feet, and have a system of side slopes and extend eastward at its upstream end, a system of collector ditches. The channel will require new bridges at Westphalinger Road, New Road, and Millersport Highway and reconstruction of the Transit Road Bridge.	Plan 3 involves major channelization of the main stem of Tonawanda Creek, channel improvements and modifications to Ransom Creek and diversion of flows into the Erie Barge Canal. Channel improvements and modifications to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 28,935 feet of new diversion channel will run from a point 12,920 feet upstream, having a bottom width of 100 feet with IV:3H side slopes. Then the channel would have an average bottom width to a 120-foot depth of 13 feet, and have a system of side slopes and extend eastward at its upstream end, a system of collector ditches. The channel will require new bridges at Westphalinger Road, New Road, and Millersport Highway and reconstruction of the Transit Road Bridge.	Plan 4 consists of channel modifications to Ransom Creek and diversion of flows through the Erie Barge Canal. Channel improvements and modifications to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 28,935 feet of new diversion channel will run from a point 12,920 feet upstream, having a bottom width of 100 feet with IV:3H side slopes. Then the channel would have an average bottom width to a 120-foot depth of 13 feet, and have a system of side slopes and extend eastward at its upstream end, a system of collector ditches. The channel will require new bridges at Westphalinger Road, New Road, and Millersport Highway and reconstruction of the Transit Road Bridge.	Plan 11 involves channel work in the lower portion of Tonawanda Creek, a diversion channel north of Black Creek, channel improvements and modifications to Ransom Creek, and diversion of flows through the Erie Barge Canal. The 28,935 feet of new diversion channel will run from a point 12,920 feet upstream, having a bottom width of 100 feet with IV:3H side slopes. Then the channel would have an average bottom width to a 120-foot depth of 13 feet, and have a system of side slopes and extend eastward at its upstream end, a system of collector ditches. The channel will require new bridges at Westphalinger Road, New Road, and Millersport Highway and reconstruction of the Transit Road Bridge.	Plan 13 consists of installing check valves in all structures with basements, in the 500-year floodplain outline. This non structural plan would prevent sewer backup to over 2,700 structures. However, the plan would not prevent flooding from cracks in the cellar walls, floors or in the cellar windows, doors, etc.). The area would still be flooded from overland flooding.
Level of Protection	100 Year	100 Year	100 Year	25 Year	100 Year	Varies
First Cost (1)	\$20,600,000	\$36,900,000	\$30,200,000	\$3,320,000	\$19,200,000	\$3,637,000
Annual Charges (2)						
Interest & Amortization	\$1,835,000	\$3,322,000	\$2,719,000	\$299,000	\$1,729,000	\$327,000
Annual O&M	75,000	100,000	100,000	50,000	75,000	6,000
Total	\$1,930,000	\$3,422,000	\$2,819,000	\$349,000	\$1,804,000	\$333,000
Average Annual Benefits (2)	\$2,013,000	\$2,147,000	\$2,618,000	\$1,035,000	\$2,330,000	\$322,000
Benefit to Cost Ratio	1.04	.63	.93	2.97	1.29	.97
Average Annual Net Benefits	\$83,000	-	-	686,000	526,000	-

(1) Based on August 1988 price levels.
(2) Based on August 1988 price levels and 8-7/8 percent interest rate.

Table 1

Plan 1 Environmental Issues:	Plan 2 Environmental Issues:	Plan 3 Environmental Issues:	Plan 4 Environmental Issues:	Plan 11 Environmental Issues:	Plan 13 Environmental Issues:
<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • Localized • Protection • Community • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • More Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Institutional • More Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Institutional • Localized • Protection • Community • Regional Growth • Floodplain • Properties • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Aquatics • Riparian • Wetlands • Terrestrial • Institutional • More Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Farmlands • Facilities • Roads • Aesthetics • Cultural Resources 	<ul style="list-style-type: none"> • Implementation • Institutional • Local/Regional • Protection • Community & • Regional Growth • Floodplain • Properties • Facilities • Aesthetics

available, flood damage reduction benefits would be negligible, project costs would outweigh benefits (large wetland/reservoir land areas would be required to be effective) and adverse aquatic, wetland, riparian, and terrestrial environmental impacts would likely outweigh benefits.

WITHOUT CONDITIONS (NO ACTION)

2.11 The without conditions or no action scenario indicates that the Corps of Engineers acting for the Federal Government could take no action based on an evaluation of the problems and possible solutions as directed by the study authority. With no action, without project conditions are assumed. The no action alternative is always a possibility and serves as a basis of comparison by which the other alternatives may be compared.

2.12 If no Federal action can be taken via the Corps of Engineers to address flooding problems in the lower Tonawanda Creek basin, it is expected that similar flooding and associated damages and disruption would continue in the future. Current Barge Canal operations would be expected to continue. The problem is complex and the local communities have limited capabilities in fully addressing the existing problems alone.

2.13 The project area is a substantial development area in the Buffalo Metropolitan Area. Developmental pressure is expected to continue. Wise and considerate developmental planning is encouraged.

2.14 The townships which are located in the project vicinity participate in the regular program of the National Flood Insurance Program administered by the Federal Emergency Management Agency. By this stage, flood insurance and flood plain management maps have been developed and local ordinances pertaining to new or redevelopment in the 100 year event floodplain and flood protection to the intermediate regional or 100-year flood level have been enacted. In this way, flood insurance would help to compensate residents for flood damages to existing developments, while floodplain development ordinances would reduce the potential of flood damage of any future developments or redevelopments.

2.15 Without conditions (no action) is discussed further in the Comparative Impacts of Alternatives table (this section) and in the Environmental Setting and Environmental Effects sections of this EIS, also.

PLANS CONSIDERED IN DETAIL

2.16 After preliminary plan formulation and evaluation therefore, three plans were considered reasonable and considered in detail.

2.17 No Action Plan (Without Conditions). Reference the previous section WITHOUT CONDITIONS (NO ACTION).

2.18 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. This plan would provide localized 100 year event level flood protection to the project vicinity major flood damage area (Ransom Oaks) from flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via Black Creek. Project features are depicted on Figures 5, 6, 7, and 8 and are described as follows.

2.19 Channelization of Ransom Creek would be required from the Tonawanda Creek Road bridge, at the confluence of Ransom Creek and Tonawanda Creek (Erie Barge Canal), upstream to the Hopkins Road bridge a distance of 8,829 feet. This new channel would consist of a 30-foot bottom width having 1V:2.5H sideslopes and averaging 16 feet in depth.

2.20 From the upstream face of the Hopkins Road bridge upstream to the downstream face of the Millersport Highway bridge, or for a distance of 4,338 feet, the channel bed plus 50 feet on each side of the banks would require selective clearing and snagging to pass flood flows. Work would consist of removal of dense brush, loose material, and fallen trees.

2.21 From the upstream face of the Millersport Highway bridge to the New Road bridge, a cutoff channel along the right bank is required. The cutoff channel would be 800 feet in length and have a 50-foot bottom width with 1V:2.5H sideslopes and .001 bedslope at an average depth of 6 feet.

2.22 From the upstream face of the New Road bridge to the downstream face of Glen Oak Drive bridge on Ransom Creek, or for a distance of 6,549 feet, clearing and snagging of the natural channel would be required.

2.23 Clearing and snagging of the natural channel of Black Creek would be required from its confluence with Ransom Creek upstream to the downstream face of the Smith Road bridge, or for a distance of 446 feet.

2.24 Clearing the bridge openings of shoals and sediment would be required on Ransom Creek at the Tonawanda Creek Road bridge, the Hopkins Road bridge, and the New Road bridge, and in Black Creek at the Westphalinger Road bridge.

2.25 In order to prevent increased damages on the lower Tonawanda Creek and the lower reaches of Ransom Creek near its confluence with Tonawanda Creek as a result of this plan, it would be necessary to divert up to 3,000 cfs into the Erie Barge Canal.

2.26 Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging area (adjacent several acre site) then disposed of in accordance with the Contractor's approved disposal plan (i.e., permitted clean burn, firewood, landfill). Clean excavated earthen material (about CY) would be deposited on a nearby several acre field area; graded, and revegetated.

2.27 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. This plan would provide regional 100 year event level flood protection to most of the project vicinity west of Goodrich Road. Reference Figure 5. Project features are depicted on Figures 5 through 15 and are described as follows.

2.28 Ransom Creek and Black Creek Modifications:

2.29 Channelization of Ransom Creek would be required from the Tonawanda Creek Road bridge, at the confluence of Ransom Creek and Tonawanda Creek (Erie Barge Canal), upstream to the Hopkins Road bridge a distance of 8,329 feet. This new channel would consist of a 30-foot bottom width having 1V:2.5H sideslopes and averaging 16 feet in depth.

BUFFALO METR STUDY

Results

1. THE FLOODWAY WILL CONSIST OF CLEARING AND GRASSING OF THE NATURAL CHANNEL AND 50' ON EACH SIDE OF THE NATURAL TOP OF BANK. WORK WILL CONSIST OF THE REMOVAL OF BRUSH, LOGS, LIMB MATERIAL, AND FALLEN TREES.
2. THE CUTOFF CHANNEL WILL HAVE A 30' BOTTOM WIDTH AND 1 TO 2 1/2 SIDE SLOPES.
3. THE REMAINING PROJECT WILL CONSIST OF CLEARING AND GRASSING OF RAMSON CREEK TO STATION 219+70 AND A PORTION OF BLACK CREEK. ALSO, THE CLEARING OF FOUR BRIDGE OPENINGS OF BRUSH AND SEDIMENT.

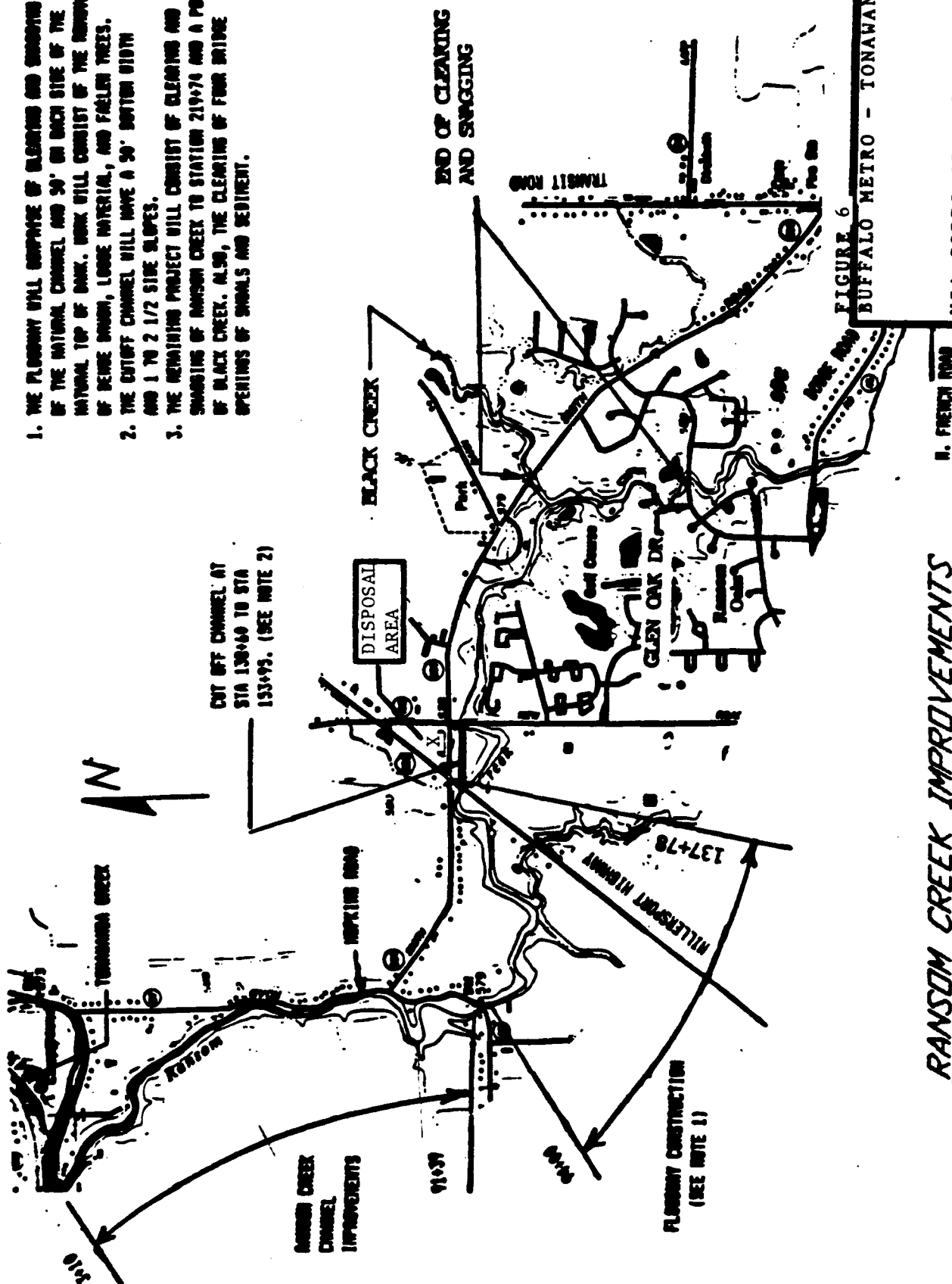


FIGURE 6

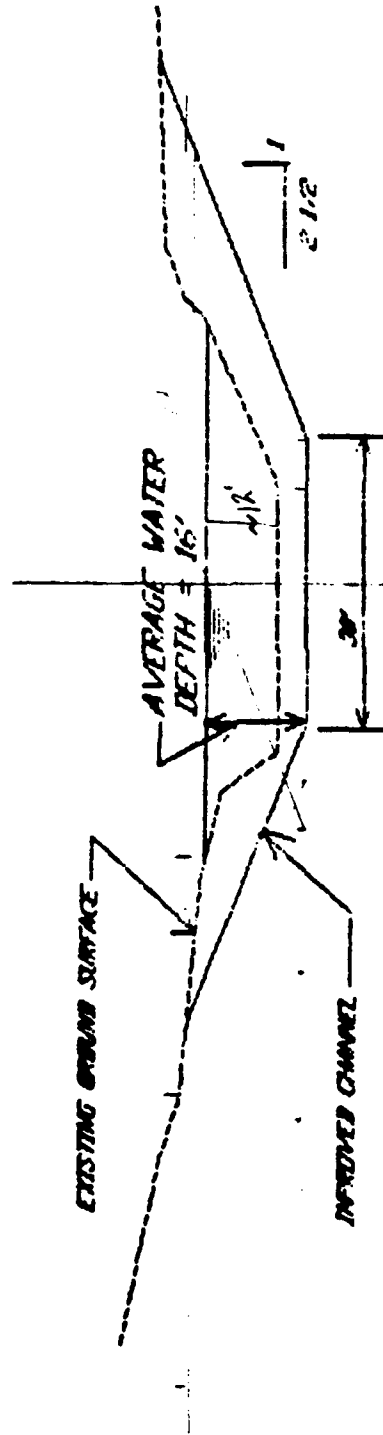
BUFFALO METRO - TONAWANDA CREEK

2025

U.S. ARMY CORPS OF ENGINEERS, BUFFALO

RANSOM CREEK IMPROVEMENTS

BUFFALO METRO STUDY



TYPICAL SECTION

RANSOM CREEK CHANNEL IMPROVEMENTS

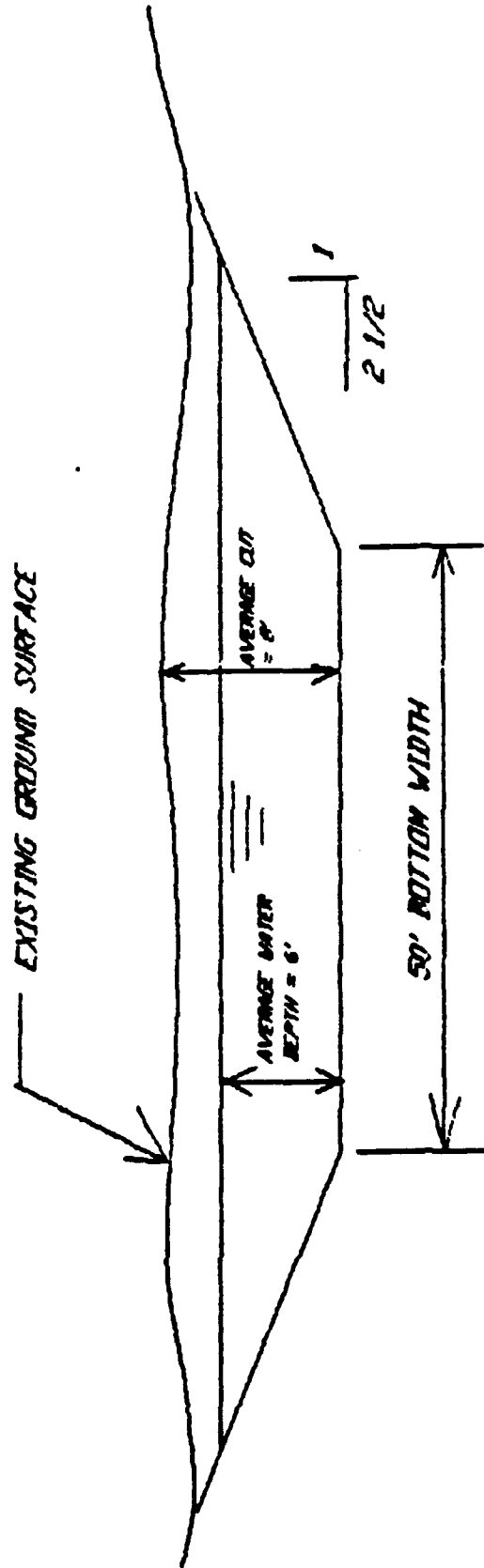
FROM TONAWANDA CREEK RD (STA. 3+10) TO HOPKINS RD (STA. 91+39)

FIGURE 7

BUFFALO METRO - TONAWANDA CREEK

USA CORPS OF ENGINEERS, BUFFALO

BUFFALO METRO STUDY



TYPICAL SECTION

RANSOM CREEK CUT-OFF CHANNEL

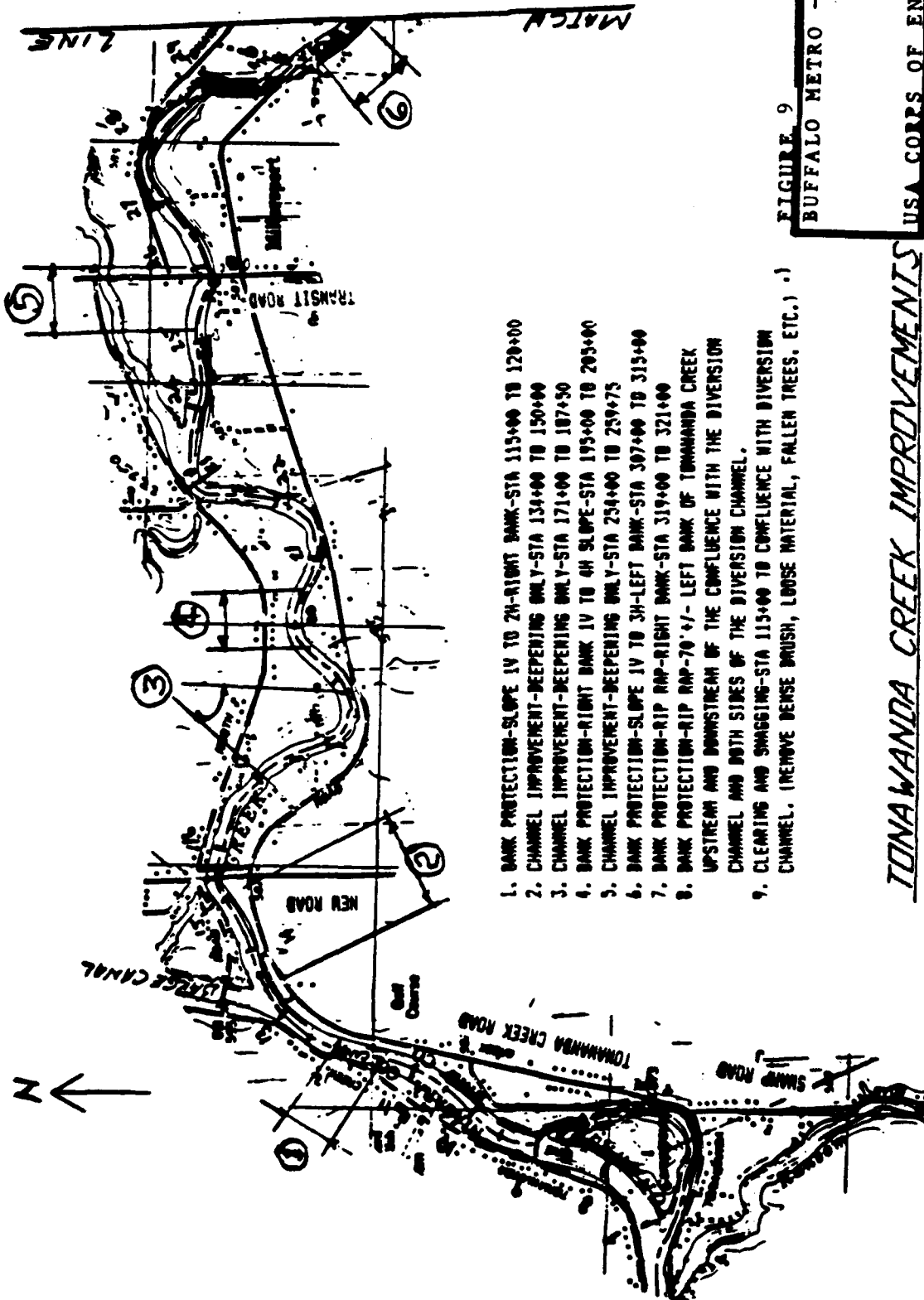
STATION 138+60 TO 153+95

FIGURE 8

BUFFALO METRO - TONAWANDA CREEK

USA CORPS OF ENGINEERS, BUFFALO

BUFFALO METRO STUDY



1. BANK PROTECTION-SLOPE IV TO 2H-RIGHT BANK-STA 115+00 TO 120+00
2. CHANNEL IMPROVEMENT-DEEPENING ONLY-STA 134+00 TO 150+00
3. CHANNEL IMPROVEMENT-DEEPENING ONLY-STA 171+00 TO 187+50
4. BANK PROTECTION-RIGHT BANK IV TO 4H SLOPE-STA 195+00 TO 205+00
5. CHANNEL IMPROVEMENT-DEEPENING ONLY-STA 234+00 TO 259+75
6. BANK PROTECTION-SLOPE IV TO 3H-LEFT BANK-STA 307+00 TO 315+00
7. BANK PROTECTION-RIP RAP-RIGHT BANK-STA 319+00 TO 321+00
8. BANK PROTECTION-RIP RAP-70' +/- LEFT BANK OF TONAWANDA CREEK UPSTREAM AND DOWNSTREAM OF THE CONFLUENCE WITH THE DIVERSION CHANNEL AND BOTH SIDES OF THE DIVERSION CHANNEL.
9. CLEARING AND SNAGGING-STA 115+00 TO CONFLUENCE WITH DIVERSION CHANNEL. (REMOVE DENSE BRUSH, LOOSE MATERIAL, FALLEN TREES, ETC.)

FIGURE 9

BUFFALO METRO - TONAWANDA CREEK

USA CORPS OF ENGINEERS, BUFFALO

TONAWANDA CREEK IMPROVEMENTS

This topographic map depicts the Tonawanda region, featuring a diversion channel and a disposal area. The map includes a grid system with various elevation points marked. Key features include:

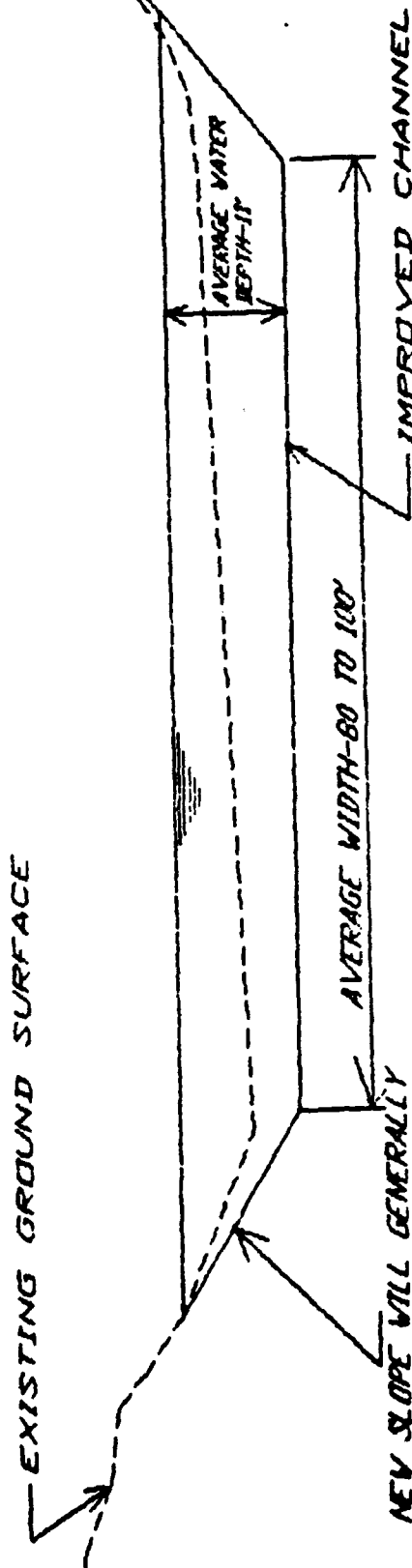
- TONAWANDA**: The central area of the map, with a river or stream flowing through it.
- DISPOSAL AREA**: A rectangular area in the lower right, labeled with a circled 8.
- DIVERSION CHANNEL**: A channel running horizontally across the middle of the map.
- BRIDGE**: A structure crossing the diversion channel, labeled with a circled 9.
- CRICK**: A small water feature in the upper left.
- Elevation Points**: Numerous numerical values (e.g., 514.0, 514.1, 514.2, 514.3, 514.4, 514.5, 514.6, 514.7, 514.8, 514.9, 515.0, 515.1, 515.2, 515.3, 515.4, 515.5, 515.6, 515.7, 515.8, 515.9, 516.0, 516.1, 516.2, 516.3, 516.4, 516.5, 516.6, 516.7, 516.8, 516.9, 517.0, 517.1, 517.2, 517.3, 517.4, 517.5, 517.6, 517.7, 517.8, 517.9, 518.0, 518.1, 518.2, 518.3, 518.4, 518.5, 518.6, 518.7, 518.8, 518.9, 519.0, 519.1, 519.2, 519.3, 519.4, 519.5, 519.6, 519.7, 519.8, 519.9, 520.0, 520.1, 520.2, 520.3, 520.4, 520.5, 520.6, 520.7, 520.8, 520.9, 521.0, 521.1, 521.2, 521.3, 521.4, 521.5, 521.6, 521.7, 521.8, 521.9, 522.0, 522.1, 522.2, 522.3, 522.4, 522.5, 522.6, 522.7, 522.8, 522.9, 523.0, 523.1, 523.2, 523.3, 523.4, 523.5, 523.6, 523.7, 523.8, 523.9, 524.0, 524.1, 524.2, 524.3, 524.4, 524.5, 524.6, 524.7, 524.8, 524.9, 525.0, 525.1, 525.2, 525.3, 525.4, 525.5, 525.6, 525.7, 525.8, 525.9, 526.0, 526.1, 526.2, 526.3, 526.4, 526.5, 526.6, 526.7, 526.8, 526.9, 527.0, 527.1, 527.2, 527.3, 527.4, 527.5, 527.6, 527.7, 527.8, 527.9, 528.0, 528.1, 528.2, 528.3, 528.4, 528.5, 528.6, 528.7, 528.8, 528.9, 529.0, 529.1, 529.2, 529.3, 529.4, 529.5, 529.6, 529.7, 529.8, 529.9, 530.0, 530.1, 530.2, 530.3, 530.4, 530.5, 530.6, 530.7, 530.8, 530.9, 531.0, 531.1, 531.2, 531.3, 531.4, 531.5, 531.6, 531.7, 531.8, 531.9, 532.0, 532.1, 532.2, 532.3, 532.4, 532.5, 532.6, 532.7, 532.8, 532.9, 533.0, 533.1, 533.2, 533.3, 533.4, 533.5, 533.6, 533.7, 533.8, 533.9, 534.0, 534.1, 534.2, 534.3, 534.4, 534.5, 534.6, 534.7, 534.8, 534.9, 535.0, 535.1, 535.2, 535.3, 535.4, 535.5, 535.6, 535.7, 535.8, 535.9, 536.0, 536.1, 536.2, 536.3, 536.4, 536.5, 536.6, 536.7, 536.8, 536.9, 537.0, 537.1, 537.2, 537.3, 537.4, 537.5, 537.6, 537.7, 537.8, 537.9, 538.0, 538.1, 538.2, 538.3, 538.4, 538.5, 538.6, 538.7, 538.8, 538.9, 539.0, 539.1, 539.2, 539.3, 539.4, 539.5, 539.6, 539.7, 539.8, 539.9, 540.0, 540.1, 540.2, 540.3, 540.4, 540.5, 540.6, 540.7, 540.8, 540.9, 541.0, 541.1, 541.2, 541.3, 541.4, 541.5, 541.6, 541.7, 541.8, 541.9, 542.0, 542.1, 542.2, 542.3, 542.4, 542.5, 542.6, 542.7, 542.8, 542.9, 543.0, 543.1, 543.2, 543.3, 543.4, 543.5, 543.6, 543.7, 543.8, 543.9, 544.0, 544.1, 544.2, 544.3, 544.4, 544.5, 544.6, 544.7, 544.8, 544.9, 545.0, 545.1, 545.2, 545.3, 545.4, 545.5, 545.6, 545.7, 545.8, 545.9, 546.0, 546.1, 546.2, 546.3, 546.4, 546.5, 546.6, 546.7, 546.8, 546.9, 547.0, 547.1, 547.2, 547.3, 547.4, 547.5, 547.6, 547.7, 547.8, 547.9, 548.0, 548.1, 548.2, 548.3, 548.4, 548.5, 548.6, 548.7, 548.8, 548.9, 549.0, 549.1, 549.2, 549.3, 549.4, 549.5, 549.6, 549.7, 549.8, 549.9, 550.0, 550.1, 550.2, 550.3, 550.4, 550.5, 550.6, 550.7, 550.8, 550.9, 551.0, 551.1, 551.2, 551.3, 551.4, 551.5, 551.6, 551.7, 551.8, 551.9, 552.0, 552.1, 552.2, 552.3, 552.4, 552.5, 552.6, 552.7, 552.8, 552.9, 553.0, 553.1, 553.2, 553.3, 553.4, 553.5, 553.6, 553.7, 553.8, 553.9, 554.0, 554.1, 554.2, 554.3, 554.4, 554.5, 554.6, 554.7, 554.8, 554.9, 555.0, 555.1, 555.2, 555.3, 555.4, 555.5, 555.6, 555.7, 555.8, 555.9, 556.0, 556.1, 556.2, 556.3, 556.4, 556.5, 556.6, 556.7, 556.8, 556.9, 557.0, 557.1, 557.2, 557.3, 557.4, 557.5, 557.6, 557.7, 557.8, 557.9, 558.0, 558.1, 558.2, 558.3, 558.4, 558.5, 558.6, 558.7, 558.8, 558.9, 559.0, 559.1, 559.2, 559.3, 559.4, 559.5, 559.6, 559.7, 559.8, 559.9, 560.0, 560.1, 560.2, 560.3, 560.4, 560.5, 560.6, 560.7, 560.8, 560.9, 561.0, 561.1, 561.2, 561.3, 561.4, 561.5, 561.6, 561.7, 561.8, 561.9, 562.0, 562.1, 562.2, 562.3, 562.4, 562.5, 562.6, 562.7, 562.8, 562.9, 563.0, 563.1, 563.2, 563.3, 563.4, 563.5, 563.6, 563.7, 563.8, 563.9, 564.0, 564.1, 564.2, 564.3, 564.4, 564.5, 564.6, 564.7, 564.8, 564.9, 565.0, 565.1, 565.2, 565.3, 565.4, 565.5, 565.6, 565.7, 565.8, 565.9, 566.0, 566.1, 566.2, 566.3, 566.4, 566.5, 566.6, 566.7, 566.8, 566.9, 567.0, 567.1, 567.2, 567.3, 567.4, 567.5, 567.6, 567.7, 567.8, 567.9, 568.0, 568.1, 568.2, 568.3, 568.4, 568.5, 568.6, 568.7, 568.8, 568.9, 569.0, 569.1, 569.2, 569.3,

BUFFALO METRO - TONAWANDA CREEK

U.S. ARMY CORPS OF ENGINEERS, BUFFALO

BUFFALO METRO STUDY

EXISTING GROUND SURFACE



NEW SLOPE WILL GENERALLY
FOLLOW EXISTING SLOPES
WHICH WILL DETERMINE THE
BOTTOM WIDTH

AVERAGE WIDTH-80 TO 100'

IMPROVED CHANNEL

TYPICAL SECTION

TONAWANDA CREEK CHANNEL IMPROVEMENTS

STATIONS 134+00 TO 150+00 171+00 TO 187+50 254+00 TO 259+75

440 CURVE YARDS TO BE REMOVED

FIGURE 11

BUFFALO METRO - TONAWANDA CREEK

USA CORPS OF ENGINEERS, BUFFALO

BUFFALO METRO STUDY

EXISTING GROUND SURFACE

AVERAGE WATER
DEPTH = 9'

BOTTOM WIDTH VARIES FROM 350' AT INCEPTION
EAST OF GOODRICH ROAD TO 65' AT THE CONFLUENCE
WITH TONAWANDA CREEK STATION 320+00

AVERAGE DEPTH
LOWER 1/3 = 12'
UPPER 2/3 = 8'

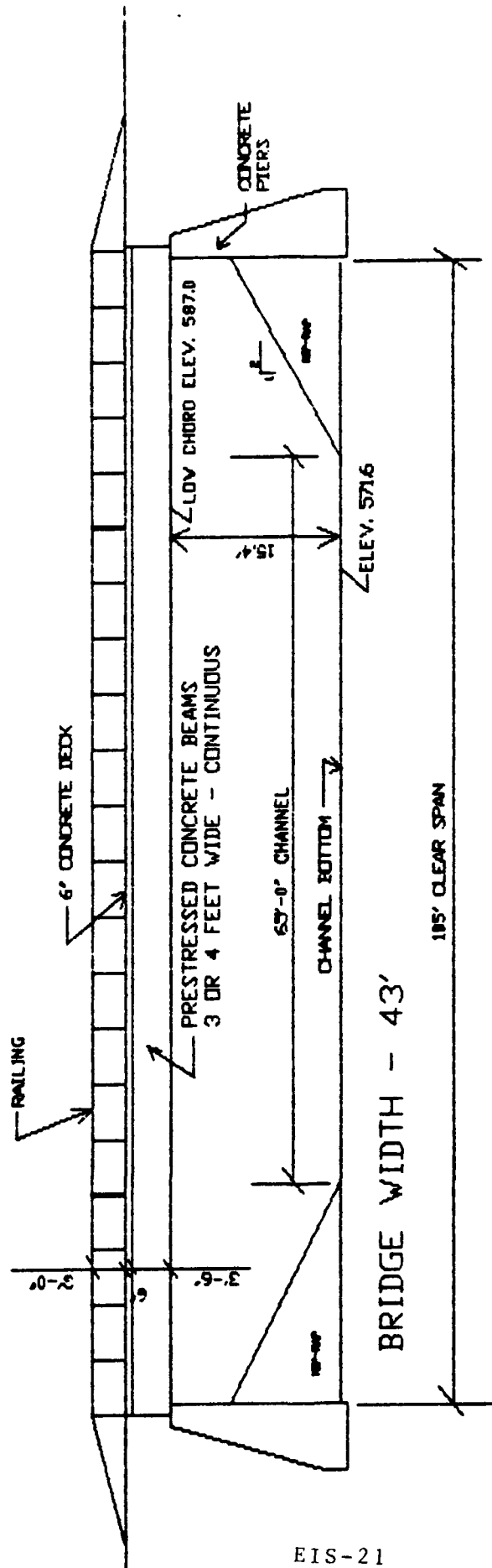
1
3

TYPICAL SECTION TONAWANDA CREEK DIVERSION CHANNEL

FIGURE 12

BUFFALO METRO - TONAWANDA CREEK

USA CORPS OF ENGINEERS, BUFFALO



PROPOSED TONAWANDA CREEK BRIDGE

CROSS SECTION

FIGURE 13
 BUFFALO METRO - TONAWANDA CREEK
 USA CORPS OF ENGINEERS, BUFFALO

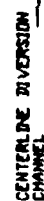


FIGURE 15

BUFFALO METRO - TONAWANDA CREEK

USA CORPS OF ENGINEERS. BUFFALO

2.30 From the upstream face of the Hopkins Road bridge upstream to the downstream face of the Millersport Highway bridge, or for a distance of 4,378 feet, the channel bed plus 50 feet on each side of the banks would require selective clearing and snagging to pass flood flows. Work would consist of removal of dense brush, loose material, and fallen trees.

2.31 From the upstream face of the Millersport Highway bridge to the New Road bridge, a cutoff channel along the right bank is required. The cutoff channel would be 800 feet in length and have a 50-foot bottom width with 1V:2.5H sideslopes and .001 bedslope at an average depth of 6 feet.

2.32 From the upstream face of the New Road bridge to the downstream face of the Glen Oak Drive bridge on Ransom Creek, or for a distance of 6,549 feet, clearing and snagging of the natural channel would be required.

2.33 Clearing and snagging of the natural channel of Black Creek would be required from its confluence with Ransom Creek upstream to the downstream face of the Smith Road bridge, or for a distance of 446 feet.

2.34 Clearing the bridge openings of shoals and sediment would be required on Ransom Creek at the Tonawanda Creek Road bridge, the Hopkins Road bridge, and the New Road bridge, and on Black Creek at the Westphalinger Road bridge.

2.35 Tonawanda Creek Modifications:

2.36 Clearing and snagging of the Tonawanda Creek channel and selective stream stabilization bank cuts and streambank protection (i.e., toe or full riprap protection) would be required from about 200 feet downstream of the confluence with the Erie Barge Canal upstream to the confluence of the diversion channel.

2.37 Construction of a diversion channel north of the Black Creek system would be required. This channel would begin at its junction with Tonawanda Creek near Westphalinger Road and Tonawanda Creek Road. From just south of its junction with Tonawanda Creek it proceeds easterly to a point mid way between Tonawanda Creek Road and Sesh Road on Westphalinger Road. From Westphalinger Road the channel proceeds directly east before heading southeast, paralleling the gas pipeline right-of-way to Sesh Road; then it parallels Sesh Road to Goodrich Road. The diversion channel would have a total length of 13,000 feet, a 250 foot average bottom width and 1 vertical on 3 horizontal sideslopes. The diversion channel will have a typical depth of 9 feet and disposal of some of the excavated materials will be along the channel to fill low areas.

2.38 A system of collector ditches would be constructed upstream (east) of Goodrich Road to funnel flood waters into the diversion channel.

2.39 A new bridge would be required on Tonawanda Creek Road just east of Westphalinger Road to span the diversion channel. The new bridge would have a 105 foot clear span and riprap would be placed just upstream and downstream of the bridge.

2.40 Low flow highway crossings would be required at Northfield Road and Goodrich Road. The crossings for these roads would be constructed such that flows of 1,000 cfs (less than a 10-year flood event) or less would flow through a series of culverts under the road. However, flows greater than 1,000 cfs in the diversion channel would flow over the roadway.

2.41 In order to prevent increased damages on the lower Tonawanda Creek and the lower reaches of Ransom Creek near its confluence with Tonawanda Creek as a result of this plan, it would be necessary to divert up to 3,000 cfs into the Erie Barge Canal.

2.42 Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging areas (several adjacent several acre sites) then disposed of in accordance with the Contractor's permitted disposal plan (i.e., permitted clean burn, firewood, landfill).

2.43 Clean excavated earthen material (about CY) would be deposited on a 185 acre field area located adjacent to the proposed diversion channel, just south of the confluence with Tonawanda Creek. This would be graded several feet above existing ground level and expeditiously revegetated.

THE NED AND RECOMMENDED PLAN

2.44 Plan 4 has been identified as the National Economic Development plan and based on overall evaluation for engineering and economic feasibility and environmental and social acceptability or in best satisfying the project planning objective is the recommended plan.

RECOMMENDED PLAN ENVIRONMENTAL CONSIDERATIONS

2.45 A number of environmental considerations have been incorporated into the plan development based on environmental agency recommendations and environmental resource significance. Environmental considerations include:

2.46 Overall project alternative evaluation indicate that Plan 4 be the recommended plan and that overall benefits exceed overall disbenefits. The plan provides a local flood damage reduction plan.

2.47 Considerations were made to minimize creek channelization needs in order to minimize adverse impacts to important aquatic and riparian habitat. Channelization primarily along one side at Ransom Creek has been incorporated to the degree possible.

2.48 The channel dimensions were minimized to minimize costs, relocations, taking of properties, and loss of farmland.

2.49 Instream construction activities would be restricted between March 1 and June 1 to avoid adverse impacts to spring-spawning fishery activities.

2.50 Incorporation of erosion protection measures during and after construction including expeditious revegetation of disturbed areas.

2.51 Incorporation of Corps of Engineers Civil Works Construction Guide Specifications entitled "Environmental Protection" (CW-01430 dated July 1978) pertaining to environmental protection of water and land related resources.

COMPARATIVE IMPACTS OF ALTERNATIVES

2.52 The following table briefly summarizes in a comparative manner, the anticipated impacts by various environmental parameters of the most reasonable plans considered in detail.

Table 2 - Comparative Impacts of Reasonable Alternatives

Evaluation Parameters	No Action Without Project Conditions	Plan 4 Channel Ransom Creek Ransom Oaks Protection	Plan 11 Channel Tonawanda Clarence Diversion
<u>Economics</u>			
<u>Benefits/Costs</u>			
Project Cost	(Not Applicable)		
Federal			
Non-Federal			
Average Annual			
Benefits			
Costs			
B/C			
Net Benefits			
<u>Natural Environment</u> <u>(Resources)</u>			
Air Quality	Ambient air quality would remain unchanged, or improve in the long-run, if Federal, State, and County air quality standards and monitoring techniques become even more upgraded in the future.	ST: Minor Adverse LT: Not Significant ST: Temporary noise and some smoke, odor, fugitive dust, carbon dioxide and carbon monoxide emissions during about one construction season, causing some short-term localized degradation of air quality in the vicinity of Ransom Creek. LT: Return to ambient air quality conditions when construction work is completed.	ST: Moderate Adverse LT: Not Significant ST: Similar short-term adverse impacts as for Plan 4, but the localized adverse impacts would also occur in the vicinity of project site locations on Tonawanda Creek where heavy construction equipment would be operated. Such short-term degradation of air quality could occur during approximately two construction seasons. LT: Return to ambient air quality conditions when construction work is completed.
Water Quality	Ambient water quality would remain basically unchanged, or improve in quality in the long-run, if Federal, State, and County water quality standards become even more upgraded in the future.	ST: Moderate Adverse LT: Moderate Adverse ST: Temporary short-term increased turbidity in Ransom Creek during construction. Some minor amount of oil or grease spilling during normal operation of heavy equipment may occur. LT: Return to ambient water quality conditions when construction work is completed.	ST: Moderate Adverse LT: Moderate Adverse ST: Similar short-term adverse impacts on water quality as for Plan 4, but the adverse impacts would also occur in the vicinity of project site locations on Tonawanda Creek - as well as to some degree downstream with regard to increased turbidity - from disruption of silt, sediment and detritus in the aquatic environment by construction equipment. Such short-term disruption to water quality may occur during two construction seasons. LT: Return to ambient water quality conditions when construction work is completed.

Table 2 - Comparative Impacts of Reasonable Alternatives (Cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions	Channel Ransom Creek Ransom Oaks Protection	Channel Ransom Creek Ransom Oaks Protection	Channel Ransom Creek Ransom Oaks Protection	Channel Tonawanda Clarence Diversion	Channel Tonawanda Clarence Diversion
Benthos	No adverse impacts due to a Federal project	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse
	would occur on benthic habitat and associated	LT: Moderate Adverse	LT: Moderate Adverse	LT: Moderate Adverse	LT: Moderate Adverse	LT: Moderate Adverse
	benthic invertebrates, since no Federal project	ST: About 10.7+ acres of existing benthic habitat	ST: About 10.7+ acres of existing benthic habitat	ST: About 10.7+ acres of existing benthic habitat	ST: About 10.7+ acres of existing benthic habitat	ST: About 10.7+ acres of existing benthic habitat
	would be constructed.	ST: This acreage, approximately 2.5+ acres of such habitat	ST: This acreage, approximately 2.5+ acres of such habitat	ST: This acreage, approximately 2.5+ acres of such habitat	ST: This acreage, approximately 2.5+ acres of such habitat	ST: This acreage, approximately 2.5+ acres of such habitat
		ST: would be filled-in along the Creek's east bank.	ST: would be filled-in along the Creek's east bank.	ST: would be filled-in along the Creek's east bank.	ST: would be filled-in along the Creek's east bank.	ST: would be filled-in along the Creek's east bank.
		ST: Selective clearing and snagging over a stream length of	ST: Selective clearing and snagging over a stream length of	ST: Selective clearing and snagging over a stream length of	ST: Selective clearing and snagging over a stream length of	ST: Selective clearing and snagging over a stream length of
		ST: about 10,887 feet in Ransom Creek and 446 feet on Black	ST: about 10,887 feet in Ransom Creek and 446 feet on Black	ST: about 10,887 feet in Ransom Creek and 446 feet on Black	ST: about 10,887 feet in Ransom Creek and 446 feet on Black	ST: about 10,887 feet in Ransom Creek and 446 feet on Black
		ST: Creek, would further destroy some existing benthic	ST: Creek, would further destroy some existing benthic	ST: Creek, would further destroy some existing benthic	ST: Creek, would further destroy some existing benthic	ST: Creek, would further destroy some existing benthic
		ST: habitat and associated invertebrates during removal of	ST: habitat and associated invertebrates during removal of	ST: habitat and associated invertebrates during removal of	ST: habitat and associated invertebrates during removal of	ST: habitat and associated invertebrates during removal of
		ST: and fallen trees, submerged snags and channel debris.	ST: and fallen trees, submerged snags and channel debris.	ST: and fallen trees, submerged snags and channel debris.	ST: and fallen trees, submerged snags and channel debris.	ST: and fallen trees, submerged snags and channel debris.
Fisheries	LT: Less diversity of benthic habitat would be	LT: Less diversity of benthic habitat would be	LT: Less diversity of benthic habitat would be	LT: Less diversity of benthic habitat would be	LT: Less diversity of benthic habitat would be	LT: Less diversity of benthic habitat would be
	anticipated where channelization and creek diversion	anticipated where channelization and creek diversion	anticipated where channelization and creek diversion	anticipated where channelization and creek diversion	anticipated where channelization and creek diversion	anticipated where channelization and creek diversion
	altered Ransom Creek. About 3.2+ acres of new benthic	altered Ransom Creek. About 3.2+ acres of new benthic	altered Ransom Creek. About 3.2+ acres of new benthic	altered Ransom Creek. About 3.2+ acres of new benthic	altered Ransom Creek. About 3.2+ acres of new benthic	altered Ransom Creek. About 3.2+ acres of new benthic
	habitat would be created in the Channel where the Creek	habitat would be created in the Channel where the Creek	habitat would be created in the Channel where the Creek	habitat would be created in the Channel where the Creek	habitat would be created in the Channel where the Creek	habitat would be created in the Channel where the Creek
	was widened by excavation. Channelized areas of the	was widened by excavation. Channelized areas of the	was widened by excavation. Channelized areas of the	was widened by excavation. Channelized areas of the	was widened by excavation. Channelized areas of the	was widened by excavation. Channelized areas of the
	Creek would also provide habitat for eventual	Creek would also provide habitat for eventual	Creek would also provide habitat for eventual	Creek would also provide habitat for eventual	Creek would also provide habitat for eventual	Creek would also provide habitat for eventual
	recolonization by aquatic invertebrates, however,	recolonization by aquatic invertebrates, however,	recolonization by aquatic invertebrates, however,	recolonization by aquatic invertebrates, however,	recolonization by aquatic invertebrates, however,	recolonization by aquatic invertebrates, however,
	benthic habitat diversity would be decreased.	benthic habitat diversity would be decreased.	benthic habitat diversity would be decreased.	benthic habitat diversity would be decreased.	benthic habitat diversity would be decreased.	benthic habitat diversity would be decreased.
Fisheries	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse	ST: Major Adverse
	LT: Major Adverse	LT: Major Adverse	LT: Major Adverse	LT: Major Adverse	LT: Major Adverse	LT: Major Adverse
	ST: Significant alteration of fish habitat in Ransom	ST: Significant alteration of fish habitat in Ransom	ST: Significant alteration of fish habitat in Ransom	ST: Significant alteration of fish habitat in Ransom	ST: Significant alteration of fish habitat in Ransom	ST: Significant alteration of fish habitat in Ransom
	Creek by channelization and channel diversion	Creek by channelization and channel diversion	Creek by channelization and channel diversion	Creek by channelization and channel diversion	Creek by channelization and channel diversion	Creek by channelization and channel diversion
	construction, shoal removal, as well as to some degree	construction, shoal removal, as well as to some degree	construction, shoal removal, as well as to some degree	construction, shoal removal, as well as to some degree	construction, shoal removal, as well as to some degree	construction, shoal removal, as well as to some degree
	by selective clearing and snagging. Approximately	by selective clearing and snagging. Approximately	by selective clearing and snagging. Approximately	by selective clearing and snagging. Approximately	by selective clearing and snagging. Approximately	by selective clearing and snagging. Approximately
	10.7+ acres of existing fish habitat would be	10.7+ acres of existing fish habitat would be	10.7+ acres of existing fish habitat would be	10.7+ acres of existing fish habitat would be	10.7+ acres of existing fish habitat would be	10.7+ acres of existing fish habitat would be
	disrupted by these structural measures. Channel	disrupted by these structural measures. Channel	disrupted by these structural measures. Channel	disrupted by these structural measures. Channel	disrupted by these structural measures. Channel	disrupted by these structural measures. Channel
	substrate would be disrupted, in-stream fishery habitat	substrate would be disrupted, in-stream fishery habitat	substrate would be disrupted, in-stream fishery habitat	substrate would be disrupted, in-stream fishery habitat	substrate would be disrupted, in-stream fishery habitat	substrate would be disrupted, in-stream fishery habitat
	diversity would be decreased and some spawning and/or	diversity would be decreased and some spawning and/or	diversity would be decreased and some spawning and/or	diversity would be decreased and some spawning and/or	diversity would be decreased and some spawning and/or	diversity would be decreased and some spawning and/or

Table 2 - Comparative Impacts of Reasonable Alternatives (Cont'd)

Evaluation Parameters	Plan 4		Plan 11	
	Without Project Conditions	Channel Ransom Creek Ransom Oaks Protection	Channel Tonawanda Clarence Diversion	
Wildlife	<p>No adverse impacts due to a Federal project would occur to wildlife, since this alternative implies that no Federal project would be constructed. Transient, seasonal, and endemic wildlife would continue to utilize habitats in the study locale of Tonawanda Creek, Ransom Creek, and Black Creek. Terrestrial, wetland, and aquatic wildlife habitats would continue to experience uncontrolled periodic flooding events that could disrupt adult and young of the year wildlife species to some degree.</p>	<p>ST: Major Adverse LT: Moderate Adverse</p> <p>ST: Approximately a total of about 7.8+ acres of terrestrial and 10.7+ acres of aquatic wildlife habitat would be significantly adversely impacted by channelization and channel diversion construction in the vicinity of Ransom Creek. Of this acreage, channelization would disrupt about 7.0+ acres of terrestrial and 7.5+ acres of aquatic habitat. Channel diversion would disrupt about 0.8+ acres of terrestrial and 3.2+ acres of aquatic habitat and, the cut-off channel would disrupt another 1.6+ acres of terrestrial habitat. Existing food cover and nesting habitat diversity would be eliminated where the aforementioned measures are constructed along the aquatic/riparian corridor, which is also utilized by wildlife as a travel lane near a developed area. About 0.8+ acres of new terrestrial herbaceous wildlife habitat may be created where the east bank slope of Ransom Creek is filled by material excavated from the nearby west bank channel diversion site. Deposition of excavated material from project construction would destroy about 20 acres of existing terrestrial idle openland, wildlife habitat at the town of Amherst's 87 acre land site (which is located at the northeast corner of Millerport Highway and Smith Road). Spoil deposited at the site would be graded and seeded with a grass or grass-legume mixture, however, eventually, if the site is left unmanaged and undeveloped, native plants would be expected to invade the disposal site, and return some of the lost habitat diversity. Additional riparian habitat along Ransom Creek would be lost by selective snagging and clearing. LT: Reduction in riparian habitat and habitat diversity along channelized and channel diversion sites would be long-term (for at least the life of the project). There would also be some reduction in riparian habitat diversity where selective clearing and snagging was done on creek banks.</p>	<p>ST: Major Adverse LT: Major Adverse</p> <p>ST: Similar short-term impacts on wildlife in the vicinity of Ransom Creek as described in Plan 4. Structural measures on Tonawanda Creek such as bank sloping, channel deepening, connector ditches, and installation of stone riprap, would disrupt about 9.1 acres of terrestrial and aquatic wildlife habitat. Of this acreage, a total of about 4.1+ acres would be terrestrial and 5.0+ acres would be aquatic habitat. Additionally, selective clearing and snagging between the mouth of Tonawanda Creek upstream to Westphalinger Road (a distance of about 20,500 feet) and additional snagging and clearing in Ransom Creek would further destroy existing habitat and reduce diversity. LT: Similar long-term impacts in Ransom Creek as described in Plan 4. Excavation of the long-term Clarence Diversion Channel would have a significant adverse impact on upland wildlife as well as to some degree on wetland wildlife by directly destroying about 99+ acres of terrestrial habitat - 3+ acres of which would be semipermanent Class 2 wetland. Construction of the cut-off channel would reduce habitat and habitat diversity over about 1.6 acres. Construction of the cut-off channel would eliminate existing habitat terrestrial diversity. Additionally, deposition of excavated material from project construction onto a privately owned terrestrial land site (located on the south side of the proposed Clarence Diversion Channel between Westphalinger Road and Northfield Road), would destroy existing openland wildlife habitat over about 184.4 acres of prime farmland soil. This would contribute significantly toward further reduction in habitat diversity in the town of Amherst. If the spoil disposal site was left undisturbed, undeveloped, and not farmed, the site would eventually recover some habitat diversity as native site plant species reclaimed the disturbed soils after the site was seeded following construction. Re-seeding the Clarence Diversion Channel spoil deposition area and cut-off channel with grass or a grass-legume mixture, would provide long-term openland terrestrial wildlife habitat over about 304+ acres.</p>	
	<p>No adverse impacts due to a Federal project would occur to vegetation, since this alternative implies that no Federal project would be constructed. Riparian woody and herbaceous vegetation along the creeks, as well as as terrestrial vegetation on uplands presently</p>	<p>ST: Significant Adverse LT: Significant Adverse</p> <p>ST: Some moderate adverse impact on aquatic plant growth is anticipated. Approximately 7.8+ acres of existing diverse riparian woody and herbaceous vegetation would be immediately destroyed by</p>	<p>ST: Significant Adverse LT: Significant Adverse</p> <p>ST: Similar long-term impacts on vegetation to those described for Ransom Creek in Plan 4. However, additional clearing and snagging, as well as construction of a shore cut-off channel along the</p>	
Vegetation				

Table 2 - Comparative Impacts of Reasonable Alternatives (Cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project Conditions		Channel Ransom Creek Ransom Oaks Protection		Channel Tonawanda Clarence Diversion	
	undergoing early, mid and late plant succession		channelization and channel diversion construction.		north bank of Ransom Creek would destroy and disrupt	
	would continue to occur, unless further		Selective clearing and snagging would destroy		more riparian vegetation. The cut-off channel would	
	development interrupts such plant growth in the		additional riparian vegetation along Ransom Creek in		destroy about 1.6+ acres of such vegetation along with	
	future.		scattered locations.		some upland forbs and shrubs. No significant adverse	
			LT: Significant reduction in riparian vegetation along		impact on aquatic vegetation in Tonawanda Creek is	
			Ransom Creek would be long-term - lasting for at least		anticipated. Construction of structural measures on	
			the life of the project. Soils on disrupted		Tonawanda Creek would destroy about 4.1+ acres of	
			terrestrial bank slopes would be seeded maintained in		riparian woody and herbaceous vegetation.	
			low growth herbaceous grass or grass-legume cover.		Additionally, construction of the Clarence diversion	
			Diversity of plant growth would be decreased.		channel will destroy about 9+ acres of upland	
					vegetation - predominantly in early, mid, and late	
					successional fields containing young hardwood trees,	
					shrubs, forbs, and grasses with scattered sedges and	
					rush - as well as about 3 acres of deciduous	
					tree/shrub wetland. Selective clearing and snagging	
					would also eliminate primarily woody plants such as	
					trees and shrubs in scattered areas along about 20,500	
					feet of Tonawanda Creek. Additionally, denposition of	
					excavated material from project construction would	
					destroy existing terrestrial vegetation diversity over	
					about 184.4 acres of prime farmland soil located on	
					the south side of the proposed Clarence Diversion	
					Channel between Westphalinger Road and Northfield	
					Road.	
					LT: Similar long-term impacts in Ransom Creek as	
					described in Plan 4. Herbaceous seedlings on soils in	
					the Clarence Diversion Channel, spoil deposition area	
					and in the cut-off channel would be done to provide	
					such long-term herbaceous plant cover over approxima-	
					tely 304+ acres of upland area. Spoil deposited at	
					the deposition site would be graded and seeded with a	
					grass or grass-legume mixture, however, eventually, if	
					the site is left unmanaged, undeveloped and not	
					farmed, native plants would be expected to reinvade	
					this fill material and return some of the lost habitat	
					diversity.	

Table 2 - Comparative Impacts of Reasonable Alternatives (Cont'd)

Evaluation Parameters	No Action		Plan 4		Plan 11	
	Without Project	Project Conditions	Channel Ransom Creek	Ransom Oaks Protection	Channel Tonawanda	Clarence Diversion
Wetlands	Since this alternative implies that no Federal project would be constructed, no adverse impacts due to project construction would occur to wetlands.	ST: Not Significant LT: Not Significant ST: No wetlands would be significantly adversely impacted by proposed channelization, channel diversion and clearing and snagging on Ransom Creek. LT: Similar to the above.			ST: Significant Adverse LT: Minor Adverse ST: About 3.04 acres of existing semipermanent deciduous tree-shrub swamp would be eliminated by direct excavation of the Clarence diversion channel. LT: Possible adverse impact on two wetlands due to influence of the deep diversion channel, which may cause some lateral drainage beyond the immediate excavation site. Since such drainage could further alter these wetlands to some degree, appropriate engineering measures would need to be taken during design and construction to preclude such a potential adverse impact. Lost wetland due to construction would be replaced to achieve no net loss of this natural resource.	
Threatened/Endangered Rare Species	Since this alternative implies that no Federal project would be constructed, no adverse impacts on threatened, endangered or rare species would occur.	ST: Not Significant LT: Not Significant ST: Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service would occur. No significant adverse impacts on threatened or rare species listed by the NYSDEC would be anticipated in Ransom Creek. LT: No significant adverse impact.			ST: Moderate Adverse LT: Moderate Adverse ST: No significant short-term adverse impacts on threatened, endangered or rare species as described in Plan 4 for the Ransom Creek portion of alternative Plan 11. With regard to Tonawanda Creek, except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service would be adversely affected. However, structural measures proposed for Tonawanda Creek may have some degree of adverse impact on a NYSDEC listed threatened species of fish - the long-eared sunfish, as well as species listed as rare by the NY Heritage Program - which includes the brook stickleback and some clams. Substrate removal and disturbance by construction on Tonawanda Creek, could disrupt or alter some habitat of the aforementioned sunfish, and possibly destroy or displace some of the rare clams that might be utilizing the aquatic substrate as habitat in the general vicinity of the project site. LT: There may be some moderate adverse long-term loss or alteration of aquatic habitat for the long-eared sunfish and rare clam species in Tonawanda Creek - where channel deepening or bank slope work is done below the water line.	

Table 2 - Comparative Impacts of Reasonable Alternatives (Cont'd)

Evaluation Parameters	No Action Without Project Conditions	Plan 4		Plan 11	
		Channel Ransom Creek Ransom Oaks Protection	Channel Tonawanda Clarence Diversion		
Human (Man-Made) Environment (Resources)					
Community and Regional Growth	Periodic flooding and associated damages would be expected to continue along lower Tonawanda, Black, and Ransom Creeks. Expected new developments need to comply with National Flood Insurance Policy associated regulations. The project area floodplain is about 16,700 acres.	ST: Minor Beneficial LT: Moderate Beneficial Flood protection to Ransom Oaks (a major flood damage area) from Tonawanda Creek via Black Creek. Problems of flooding from Tonawanda and Black Creek would remain. Expected new developments need to comply with National Flood Insurance Policy associated regulations. This plan would impact about 30 acres of land. No reduction in the 100 year event floodplain.	ST: Minor Beneficial LT: Major Beneficial The project would provide 100 year event level flood protection to areas along lower Tonawanda, Black, and Ransom Creeks (including Ransom Oaks). The 100 year event level floodplain would be reduced accordingly. Expected new developments need to comply with National Flood Insurance Policy associated regulations based on revised floodplain designations. This plan would impact about 150 acres of land and reduce the 100 year event floodplain by about 11,000 acres.		
Displacement of People	Periodic flooding and associated temporary displacement of people would be expected to continue along lower Tonawanda, Black, and Ransom Creeks.	ST: Minor Adverse LT: Minor Beneficial Implementation of this plan would likely require acquisition of a home and some properties in close proximity to Ransom Creek.	ST: Moderate Adverse LT: Moderate Beneficial Implementation of this plan would likely require acquisition of several homes and some properties in close proximity to lower Tonawanda and Ransom Creeks and along the diversion channel alignment.		
Displacement of Farms	Not Applicable	ST: Minor Adverse LT: Minor Adverse Implementation of this plan would likely require acquisition of about 30 acres of (potential farmland) land in close proximity to Ransom Creek.	ST: Moderate Adverse LT: Moderate Adverse Implementation of this plan would likely require acquisition of about 150 acres of land adjacent to lower Tonawanda Creek (about 20 acres), Ransom Creek (about 30 acres), and along the diversion alignment (about 90 acres). That along the diversion alignment is primarily active or inactive farmland within the Clarence Newstead (14) agricultural district. Soil wetness is limiting factor in this area.		
Business/Industry Employment/Income	Although most flood damages in the project area pertain to residential developments some pertain to associated commercial developments. Similar to existing flooding conditions and associated flood damages would be expected. Generally, moderate growth in business, employment, and income is anticipated for the region. New developments need to comply with National Flood Insurance Policies.	ST: Minor Beneficial LT: Minor Beneficial Project construction would provide short-term employment for a construction firm and a small work force of employees probably for one construction season. The project would provide up to 25 year event flood protection to the localized Ransom Oaks area (including a few commercial developments) from Tonawanda Creek via Black Creek. Associated periodic flooding disruptions and damages would be alleviated.	ST: Moderate Beneficial LT: Moderate Beneficial Project construction would provide employment for one or more construction firms and associated employees probably for two or more construction seasons. The project would provide 100 year event level flood protection to the floodprone Tonawanda, Black, and Ransom Creeks area (including a few commercial developments). Associated periodic flooding disruptions and damages would be alleviated.		
Recreation	Anticipated regional recreational demands include those for facilities for: boating, swimming, biking, hiking, golfing, and relaxing in the park.	ST: Minor Adverse LT: Not Significant Construction related disruption to water quality, fisheries, and associated fishing activities along Ransom Creek. Construction related disruption to Glen Oaks golf course and associated developments. Some project related recreational development potential in the Ransom Creek vicinity.	ST: Minor Adverse LT: Not Significant Construction related disruption to water quality, fisheries, and associated fishing activities along lower Tonawanda and Ransom Creeks. Construction related disruption to Glen Oaks and Green Wood golf course and associated developments. Some project related recreational development potential in the Tonawanda and Ransom Creeks vicinities.		
Public Facilities and Service	Periodic flooding would continue to disrupt some normal public facilities and services. Public facilities and services would be needed to facilitate associated flood emergency operations.	ST: Minor Adverse LT: Minor Beneficial Some public facilities and services may be utilized to facilitate project construction in the Ransom Oaks vicinity. Police patrols, traffic control. Use of local roads. Relocation of some utilities. Staging areas.	ST: Minor Adverse LT: Moderate Beneficial Some public facilities and services may be utilized to facilitate project construction in the Tonawanda and Ransom Creeks areas. Police patrols, traffic control. Use of local roads. Relocation of some utilities. Staging areas.		

Table 2 - Comparative Impacts of Reasonable Alternatives (Cont'd)

Evaluation Parameters	No Action Without Project Conditions	Plan 4 Channel Ransom Creek Ransom Oaks Protection	Plan 11 Channel Tonawanda Clarence Diversion
Property Values and Tax Revenues	<ul style="list-style-type: none"> The average value of farmland in Erie and Niagara Counties is roughly estimated at \$2,000 per acre. The project vicinity is a major growth area in the Buffalo Metropolitan area. Property values and associated tax revenues are relatively increased over average values. This is anticipated for some time in the future. 	<ul style="list-style-type: none"> ST: Minor Adverse LT: Minor Beneficial The project would provide up to 25 year event level flood protection to the existing floodprone Ransom Oaks development from Tonawanda Creek via Black Creek. The 100 year event level floodplain would not be altered significantly. Some slight increase in area property values and associated tax revenues may occur. Project costs would be cost shared between Federal, State, and local interests. Thirty acre project construction impact area. 	<ul style="list-style-type: none"> ST: Moderate Adverse LT: Moderate Beneficial The project would provide 100 year event level flood protection to floodprone areas along lower Tonawanda, Black, and Ransom Creeks. The 100 year event floodplain would be reduced substantially. Some increase in area property values and associated tax revenues would likely occur. Project costs would be cost shared between Federal, State, and local interests. A 150 acre project construction impact area. Reduces the 100 year event floodplain by 11,000 acres.
Noise and Aesthetics	<ul style="list-style-type: none"> With increased developments, associated increased noise, and changed aesthetics would be expected. 	<ul style="list-style-type: none"> ST: Minor Adverse LT: Minor Adverse Construction related noise and disruption to area aesthetics would occur in the Ransom Creek (Oaks) vicinity. Although vegetation would be retained or re-planted to the degree possible for aesthetic and fish and wildlife reasons, Ransom Creek would be straightened, deepened, and widened, with generally less riparian vegetation. 	<ul style="list-style-type: none"> ST: Moderate Adverse LT: Minor Adverse Construction related noise and disruption to area aesthetics would occur in the lower Tonawanda Creek, diversion channel, and Ransom Creek project areas. Although vegetation would be retained or re-planted to the degree possible for aesthetic and fish and wildlife reasons, creek channels would be straightened, deepened, and widened with generally less riparian vegetation. Tree and shrub vegetation would be removed along the Clarence Diversion alignment and the relatively flat terrain would be altered to that of the diversion channel.
Community Cohesion	<ul style="list-style-type: none"> Flooding and associated problems and concerns would be expected to continue. Continued National Flood Insurance Policy associated regulations in floodplain areas. Continued developmental concerns. 	<ul style="list-style-type: none"> ST: Minor Adverse LT: Minor Beneficial The project would provide up to 25 year even level flood protection to the localized Ransom Oaks vicinity from Tonawanda Creek via Black Creek. Potential flooding problems from Tonawanda via Black Creek would remain. The 100 year event level floodplain would not be significantly altered. Because of the localized scope of the project fewer adverse environmental impacts due to project implementation would occur; however, few regional benefits would be realized. 	<ul style="list-style-type: none"> ST: Moderate Adverse LT: Moderate Beneficial The project would provide 100 year event level flood protection to floodprone Tonawanda, Black, and Ransom Creeks areas. The 100 year event level floodplain would be reduced substantially. Because of the more regional scope of the project increased adverse environmental impacts due to project implementation would occur; however, more regional flood damage reduction benefits would be realized.
Cultural Resources	<ul style="list-style-type: none"> Reference statements for Plan 4 and Plan 11. 	<ul style="list-style-type: none"> ST: Minor Adverse LT: Not Significant A cultural resources survey has been conducted for the project vicinity. Several areas of potential cultural resources significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to project construction (Three areas involved). 	<ul style="list-style-type: none"> ST: Minor Adverse LT: Not Significant A cultural resources survey has been conducted for the project vicinity. Several areas of potential cultural resources significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to project construction (Five areas involved).

SECTION 3 - ENVIRONMENTAL SETTING

INTRODUCTION

3.01 This section briefly presents an overview of the existing and anticipated future environmental setting in the vicinity of the considered project in order to provide a basis for impact assessment and evaluation of the various considered alternative plans.

GENERAL ENVIRONMENTAL CONDITIONS

3.02 The Tonawanda Creek watershed is a relatively large watershed consisting of several sub watersheds which drain an area of about 648 square miles. The project area is located in the lower reaches of the Tonawanda Creek watershed in the Buffalo Metropolitan Area just northeast of Buffalo. Reference Figures 1 and 2. The terrain in the area is relatively flat. The upper reaches of the project area is more rural with abundant field and wooded areas while the lower reaches are increasingly developed or developing primarily as a suburban area to Buffalo. Flooding is a periodic problem in the area. Basically flood waters from Tonawanda Creek overflow the creek bank at about Salt Road and then flow through Black Creek and Ransom Creek; thus forming two highflow flood areas through the project area. Flood damages include those to residential, commercial, and public properties. Tonawanda Creek in the project vicinity is a relatively large creek ranging from about 45 feet wide and 5 feet deep in the upper reaches to about 100 feet wide and 12 feet deep in the lower reaches. The lower reach also serves as part of the Erie Barge Canal System. Black and Ransom Creeks are considerably smaller, generally 10 to 45 feet wide and several feet deep. The creeks are generally lined with mature tree and shrub vegetation. The creeks and project area provide a diversity of habitat for a variety of fish and wildlife species.

SIGNIFICANT RESOURCES

3.03 The following parameters are significant environmental resource parameters which are briefly discussed and would or could be affected (adverse or beneficial) with some significance due to potential project implementation of one or the other most reasonable considered alternatives. They are: air quality, water quality, benthos, fisheries, wildlife, vegetation, wetland, threatened/endangered/rare species, community and regional growth, displacement of people, displacement of farms, business/industry and employment/income, recreation, public facilities and services, property values and tax revenues, noise and aesthetics, community cohesion, and cultural resources.

NATURAL RESOURCES

3.04 Air Quality. Based on information provided in the Compilation of Codes, Rules, and Regulations of the State of New York, Chapter III Air Resources, Title 6, Part 276 indicates that, the project study area in the town of Amherst lies within an area designated as having an air quality level classification of

Level III, whereas the project study area in the town of Clarence lies within an area designated as being Level II. Land uses associated with the Level II classification contain predominantly single and two family residences, small farms, and limited commercial services and industrial development. Land uses associated with the Level III air quality classification contain densely populated, primarily commercial office buildings, department stores, and light industries in small and medium metropolitan complexes, or suburban areas of limited commercial and industrial development near large metropolitan complexes. A review of the 1985 New York State Department of Environmental Conservation Department (NYSDEC) publication entitled, New York State Air Quality Report Ambient Air Monitoring System indicates that, all air quality monitoring stations in the Niagara Frontier Region (which includes those nearest the potential project area) are in compliance with current Federal and State ambient air quality standards. In general, air quality in the potential project vicinity is considered to be in attainment with regard to such primary pollutants as sulfur dioxide, total suspended particulates, carbon monoxide, ozone, nitrogen dioxide, lead, sulfates, and nitrates.

3.05 Water Quality. Based on best usage of waters, the following are the current NYSDEC existing water quality classifications for creeks in the general vicinity of the project study area: Erie Barge Canal - classified as "C"; from the junction of the Erie Barge Canal upstream on Tonawanda Creek to abut the Genesee County line - classified as "B"; Ransom Creek from the Barge Canal upstream to its junction with Gott Creek - classified as "C" (the remainder of Ransom Creek is classified as "Ct"); and Black Creek is classified as "D". In general, best usage for each of the aforementioned NYSDEC water quality classifications are described as follows: Waters classified as "B" may be best used for bathing and any other usages except as a source of water supply for drinking, culinary or food processing purposes. Waters classified as "C" may best be used for fishing and other usages except for bathing or as a source of water supply for drinking, culinary or food processing purposes. A "Ct" classification indicates the waters contain or are capable of containing trout, whereas, waters classified as "D" are considered suitable for secondary recreation, but due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery or streambed conditions, the waters will not support the propagation of fish.

3.06 Water temperature, flow velocities, dissolved oxygen, pH, and turbidity parameter measurements taken by the U.S. Fish and Wildlife Service (USF&WS) as a part of their 1988 biological survey of creeks in the potential project area, provides some information on ambient water quality conditions found at the time of the field surveys. In Tonawanda Creek, late spring and summer sampling period, water temperatures varied from around 23° Centigrade (°C) to 27°C, water velocity ranged from "still" to about 1.0 feet/second; dissolved oxygen was about 9 parts per million (ppm); pH ranged from 8.8 to 9.8 and water clarity was turbid throughout the potential project locale. Ransom Creek water temperatures during the aforementioned sampling period ranged from 19°C to 24°C; water velocity varied from about .1 feet/second to 1.0 feet/second; dissolved oxygen ranged from 9 to 13 ppm; pH ranged from 6.9 to 8.4; and water clarity was turbid to very turbid. With regard to Black Creek water temperatures varied from 19°C to about 25°C; water velocity less than .1 feet/second; dissolved oxygen ranged from as low as 4 ppm to about 10 ppm; pH varied from 7.6 to 9.0; and water was somewhat turbid. Water temperatures in Beeman Creek

in the general vicinity of Delaware Road and Salt Road in the town of Clarence averaged about 18°C; water velocities varied from .4 feet/second to less than .1 feet/second; dissolved oxygen ranged from 8 ppm to 14 ppm; pH ranged from 7.7 to 9.0; and the water was clear. The 1988 USF&WS biological survey for Tonawanda, Black, and Ransom Creeks also pointed out that the low numbers and diversity of benthic organisms as well as preponderance of Chironomid larvae (midges) are indicative of the lower water quality and poor substrate conditions in Tonawanda Creek. All the aforementioned Creeks are generally slow-moving to sluggish with low to very low water levels - except for Tonawanda Creek - during dry periods.

3.07 Benthos. In general, low numbers and diversity of benthic invertebrates were obtained at all sampling stations in the potential area on Tonawanda, Black, and Ransom Creeks during the 1988 USF&WS biological survey. By utilizing a Petite Ponar sampler with a sample area of .22 feet², four taxa of invertebrates were found in Tonawanda Creek - Chironomidae (midges), Oligochaeta (Aquatic earthworms), Pelecypoda (clams), and Ephemeroptera (mayflies); sampling in Ransom Creek obtained the aforementioned benthic organisms plus Trichoptera (caddisflies) and Amphopoda (scuds); benthic organisms obtained from Black Creek included midges, aquatic earthworms, scuds, and Decapoda (crayfish). The one station sampled at Beeman Creek indicated that the sample was dominated by midges and aquatic earthworms.

3.08 Fisheries. The main stem of Tonawanda Creek and its associated tributaries in the potential project area provide aquatic habitat for a variety of warmwater game and non-game fish species. A recent letter to the Corps of Engineers - Buffalo District from the NYSDEC office in Olean, New York, dated 2 June 1989 included information that pointed out the significance of Tonawanda Creek and Ransom Creek as fisheries habitat. NYSDEC regards Tonawanda Creek as being a valuable natural resource in western New York. The letter stated that "Tonawanda Creek in Amherst upstream of its junction with the Barge Canal meanders through a corridor that is not excessively developed. These characteristics alone make it a valuable habitat for fish..." The letter also stated that "the stream supports populations of northern pike, smallmouth bass, and walleye. Because Tonawanda Creek is a relatively large stream, the fish and wildlife values associated with it are proportionately greater."

3.09 In order to obtain some current information about fish species inhabiting Tonawanda Creek, Ransom Creek, Black Creek, and Beeman Creek in the general locale of the potential project area, the Corps of Engineers contracted a biological field sampling study with the USF&WS, which was accomplished on these waterways in 1988. Between the Erie Barge Canal in the town of Amherst, and Rapids Road in the town of Clarence, Erie County, five stations in Tonawanda Creek were sampled for fish in June and August. Three sampling stations on Ransom Creek (between Hopkins Road and Dodge Road in the town of Amherst), four stations on Black Creek (between Smith Road in the town of Amherst and Goodrich Road in the town of Clarence), and one station on Beeman Creek (near the intersection of Delaware Road and Salt Road in the town of Clarence) were sampled for fish in June, August, and late September. A brief summary of results of the fishery portion of the biological sampling survey for each of the aforementioned creeks follows:

3.10 During the field sampling survey on Tonawanda Creek, fifteen species of fish were captured which included the bluntnose minnow, carp, goldfish, golden shiner, shorthead redhorse sucker, brown bullhead, channel catfish, largemouth bass, rockbass, bluegill, pumpkinseed, walleye, greenside darter, Johnny darter, and northern pike. The USF&WS biological study report on the survey (dated 1988) indicates that "at the stations sampled, the fish species taken generally represent warmwater streams that are less than high quality. The carp and suckers, for example, are reflective of turbidity tolerant species, as is the walleye which is a prized gamefish." The biological report also mentioned that newspaper and local resident reports point out that walleyes have been found inhabiting the Creek in the vicinity of Rapids and downstream near the Creek's confluence with the Erie Barge Canal.

3.11 On Ransom Creek, the biological report states that "the range of fish species collected again represented fishes that are relatively tolerant of siltation and turbidity, although the presence of the rainbow darter in September at one station in Ransom Creek, represents a species that is intolerant of low water quality conditions. At this upstream station, however, the darter was taken in a riffle area over gravel where the water tended to be considerably clearer than was usually encountered on Ransom Creek. Other fish species captured during the field survey were the bluntnose minnow, largemouth bass, bluegill, pumpkinseed, greenside darter, Johnny darter, northern pike, common shiner, creek chub, spottail shiner, spotfin shiner, white sucker, and smallmouth bass."

3.12 Of the fish collected on Black Creek by the USFWS, the numbers were dominated by the central mud minnow at one sampling site in the general vicinity of Kenfield Road in the town of Clarence. Nearly half the fish captured in this creek were mud minnows. The Creek was also found to contain carp, golden shiners, brown bullhead, largemouth bass, pumpkinseed, yellow perch, chain pickerel, and gizzard shad. Juvenile bluegills and a juvenile northern pike were also collected during the field sampling of this creek. In April 1988, a carcass of an adult northern pike was found on the bank adjacent to Black Creek on the south side of Kenfield Road. The USF&WS biological report indicated that "this is suggestive of northern pike spawning activity in the upper reach of Black Creek."

3.13 For the purpose of comparison, the USF&WS sampled one station for fisheries on Beeman Creek south of Black Creek, in the general vicinity of the intersection of Delaware Road and Salt Road. Fish species found in this locale were the common shiner, bluntnose minnow, spottail shiner, spotfin shiner, greenside darter, rainbow darter, blackside darter, and Johnny darter. The biological report indicated that the fish species collected from this creek "were probably the most indicative of high quality water conditions." The number of rainbow darters (sixteen) captured at this sampling station "suggests that the clear water and low level of siltation was the prevalent condition, at least at this station, as opposed to the other creeks where excess turbidity appeared to be a chronic condition."

3.14 Wildlife. There are a combination of existing land use types in the potential project locale that provide an interspersed of food, cover, breeding, and nesting habitat for a variety of wildlife. The diversity of habitat ranges from farmland that is newly cultivated to crop fields in grain, hay or some truck crops (vegetables), to early-mid- and late successional fields containing grasses, legumes, forbs, shrubs, and young trees interspersed with hedgerows. Other habitat types found are terrestrial hardwood woodlands, some seasonally flooded palustrine wooded areas (classified as wetlands by NYSDEC) and also, vegetated riparian zones established with mixtures of herbaceous plants, vines, overhanging trees, and shrubs adjoining the watercourse corridors of Tonawanda Creek and its associated tributaries. Openland, woodland, and wetland wildlife species are attracted to this diversity of habitat. Avian, mammalian, reptilian, and amphibian wildlife that utilize the potential project area - seasonally and/or year-round - are generally representative of similar areas in Western New York. Mammals that may be found include mice, voles, moles, Norway rat, fox, raccoon, mink, weasel, muskrat, opossum, skunk, red and gray squirrels, cottontail rabbit, bats, woodchuck, chipmunk, and whitetail deer.

3.15 With regard to avian, reptilian, and amphibian wildlife, pheasants, songbirds, hawks, owls, crows, and other birds utilize habitats in the vicinity of the proposed project study area. During cursory spring and summer field trips along roadways in the study area by a Corps ecologist, a variety of such wildlife were observed. Among the bird species seen were the white-breasted nuthatch, American robin, cardinal, bluejay, American goldfinch, ruby-throated hummingbird, red-winged blackbird, common grackle, starlings, mourning dove, rose-breasted grosbeak, mallard ducks, blue winged teal, wood duck, crows, and purple martin. A review of maps in the recently published text entitled "Atlas of Breeding Birds in New York State" (edited by Robert F. Andrie and Janet R. Carroll, 1988 - published by Cornell University Press), it is estimated that about 100 species of birds or more may breed or potentially breed in or around the general vicinity of the potential project study area. Among the amphibians and reptiles observed or heard during the aforementioned field trips were the spring peeper, leopard frog, green frog, bullfrog, snapping turtle, garter snake, and northern water snake.

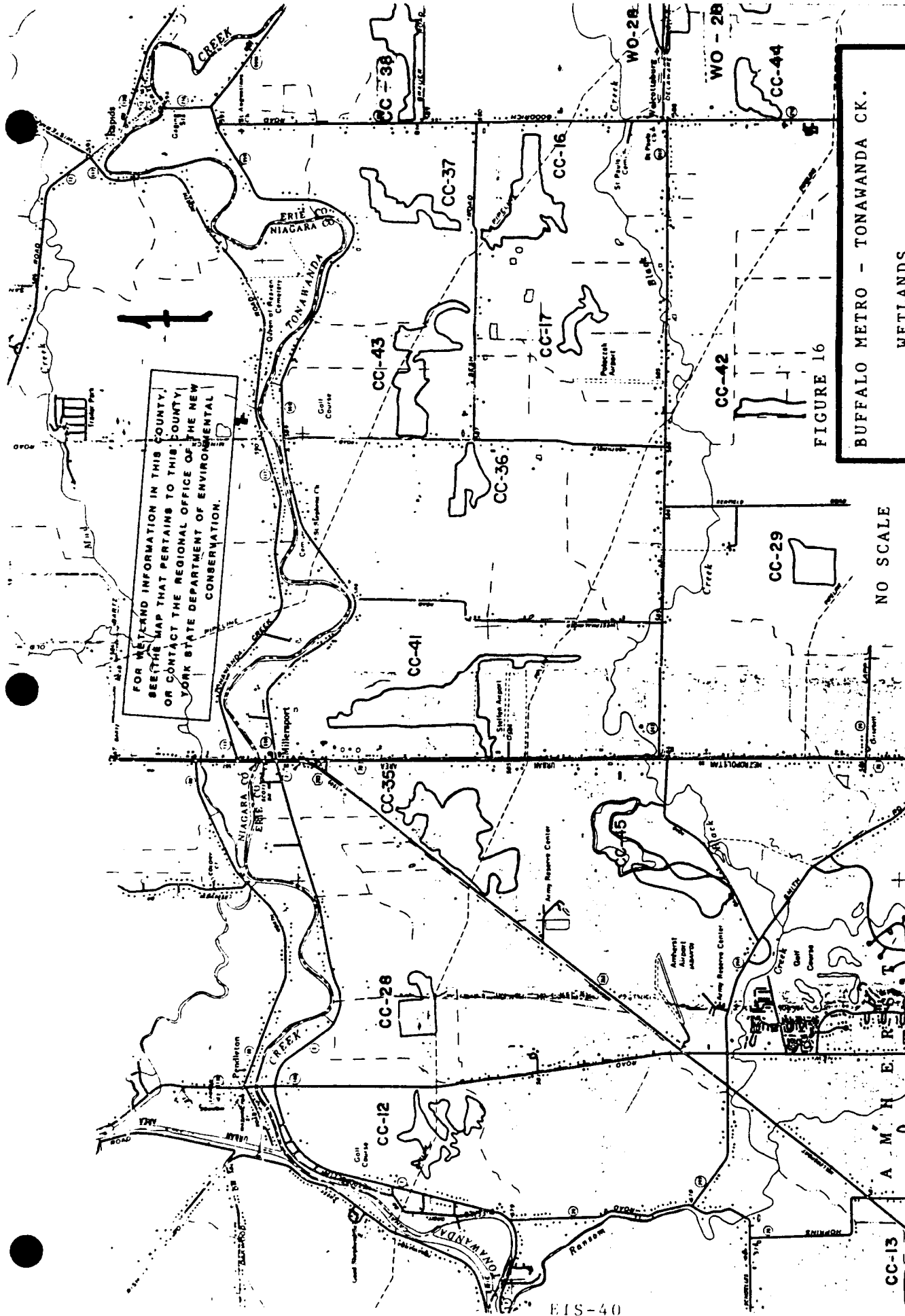
3.16 Vegetation. Banks along waterways and terrestrial areas in the general project locale contain a rich variety of woody and herbaceous vegetation ranging from tall hardwood trees, to an understory of young tolerant and intolerant hardwood trees, shrubs, vines, forbs, and grasses. Plants representing at least forty-eight families were observed during the 1988 USF&WS biological survey. Among the mixtures of woody plants seen are trees, shrubs, and vines such as boxelder, red maple, silver maple, black walnut, ash, eastern cottonwood, black willow, trembling aspen, tree-of-heaven, American basswood, elm, tartarian honeysuckle, arrowwood viburnum, dogwood (red-osier, red-panicle), speckled alder, gooseberry, choke-cherry, hawthorne, shrub-sized willow, Virginia creeper, virginia-bower, and wild grape. Herbaceous vegetation consisting of forbs and grasses contributing to the dense ground cover commonly included such plants as poison ivy, Indian hemp, milkweed, oxeye daisy, daisy fleabane, goldenrod, ragweed, white snakeroot, common burdock, thistle, Dames rocket, mustard, geranium, gill-over-the-ground, sweet clover (yellow, white), Alsike clover, birdsfoot trefoil, wild onion, curled dock, sorrel, buttercup,

wood anemone, meadow rue (tall, early), raspberry, common strawberry, bedstraw, stinging nettle, Queen Ann's lace, aster (New England, bushy), beggarstick, cocklebur, chickory, tickseed-sunflower, timothy, teasel, and grasses (quake, orchard, fescue, bluegrass).

3.17 The steep banks, deep water, and turbidity associated with much of Tonawanda Creek - particularly between its juncture with the Erie Barge Canal upstream to about Rapids Road in the town of Clarence, apparently provides poor habitat for establishment of aquatic plants; few to no aquatic macrophytes (submergent, floating, or emergent) were observed in this stretch of its waterway. The majority of such plants were encountered either to some degree or commonly in or along the shallower and narrower tributaries of Ransom and Black Creeks. Aquatic macrophyte plants seen included arrowhead, coontail, filamentous algae, softstem bulrush, sedges, rushes, water milfoil, waterweed, lesser duckweed, curly leaf pondweed, floating-leaved pondweed, and broad-leaved cattail. Hydric soils along creek banks and in poorly drained terrestrial areas of the potential project locale contained scattered establishments of swamp milkweed, touch-me-not, forget-me-not, horsetail, reed canarygrass, barnyard grass, iris (yellow, blue flag), purple loosestrife, plantain, vervain, and smartweed, along with sedges, rushes, and cattail.

3.18 Wetlands. Reference Figure 16. Wetlands near the potential route of the proposed overland diversion channel portion of the project, located west of Goodrich Road and north of Sesh Road in the town of Clarence, are seasonally flooded wetlands subject to a high water table. NYSDEC has coded these wetlands as being CC-37 and CC-43 on their wetland overlay maps for the Clarence Center U.S. Geologic Survey quadrangle. The coded wetland CC-37 is a Class 2 wetland that contains about 60 percent deciduous swamp and 40 percent shrub swamp, whereas the coded wetland CC-43 is composed of about 2.2 percent emergent aquatic vegetation, 67 percent deciduous swamp and 30.6 percent shrub swamp (Personnel communication with NYSDEC, Region 9, July 1989). The deciduous swamp which consists primarily of woody plants, includes such woody vegetation as red maple, eastern cottonwood, aspen American elm, ash, and blackwillow trees. The shrub swamps contain some of the shrub species previously mentioned in the vegetation section of this report as well as other shrubs able to stand temporary seasonal inundation or wet conditions. The emergent marsh wetland is dominated by herbaceous aquatic plants that may include bulrush, cattail, arrow arum, pickerel weed, and scattered sedges.

3.19 Threatened and Endangered Species. As stipulated by the USF&WS in their Biological Study Report for Tonawanda, Black, and Ransom Creeks, Erie County, New York 1988, "except for transient individuals, no Federally listed or proposed endangered or threatened species under our jurisdiction are known to exist in the project impact area." However, in a coordination letter from NYSDEC dated 2 June 1989, it was indicated that the longear sunfish (Lepomis megalotis) is listed as being a "threatened" species in New York State and that a text entitled Inland Fishes of New York (Lavett C. Smith, 1985) indicated that this fish was found in Tonawanda Creek. Also, a coordination letter received from the NYSDEC Significant Habitat Unit, dated 24 January 1989, identified a number of shellfish species ranked as rare by the New York Natural Heritage Program, along with two fish species - the brindled miltom (Noturus miurus) and longear sunfish - as being found in various parts of Tonawanda Creek within the town of Clarence. Among the shellfish species found were the



BUFFALO METRO - TONAWANDA CK.

WETLANDS

USA CORPS OF ENGINEERS, BUFFALO

Source: Fresh Water Wetlands
N.Y.S.D.E.C.

State Designation
(ie. CC - 43)

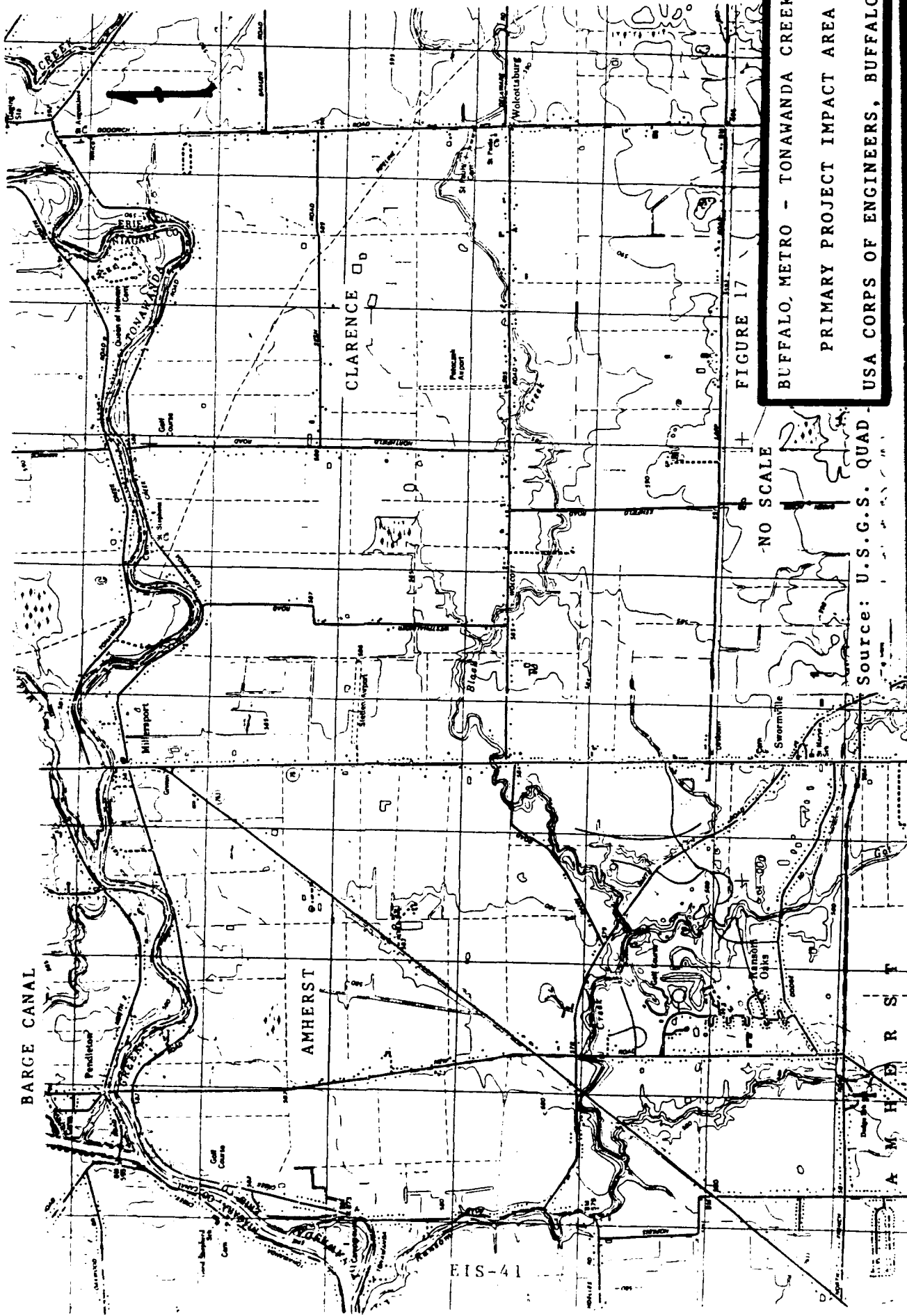
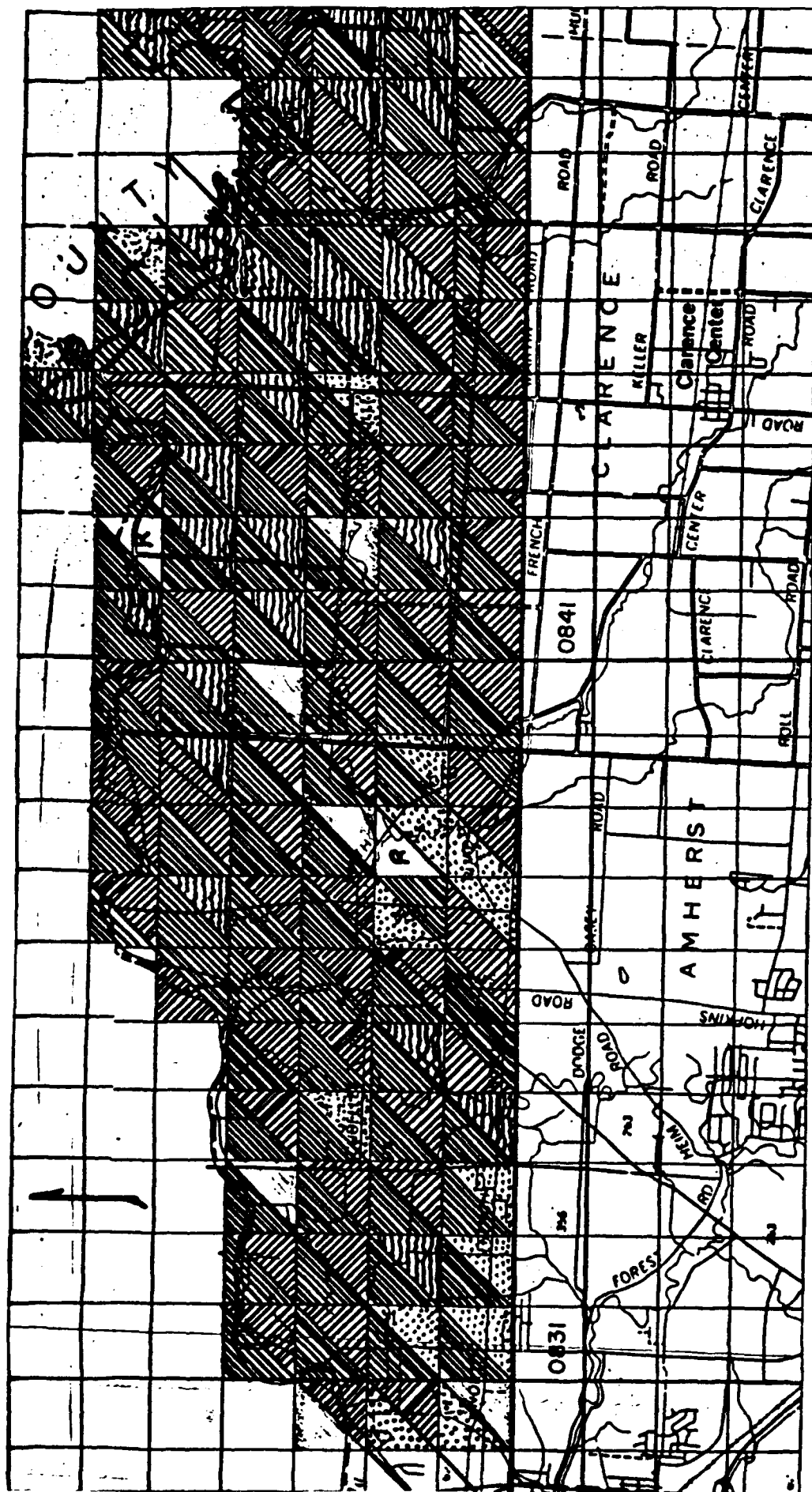


FIGURE 17
BUFFALO, METRO - TONAWANDA CREEK
PRIMARY PROJECT IMPACT AREA
USA CORPS OF ENGINEERS, BUFFALO

NO SCALE

Source: U.S.G.S. QUAD



KEY TO SYMBOLS

L1 - Primary Land Use

L2 - Secondary Land Use

Source: Based on information provided by Erie County from their Development Decision Support System (DDSS)

462  Agricultural

30% Wooded

1132		Water or Wetland
------	---	------------------

32 [REDACTED] Transportation, Communication, Commercial, Urban

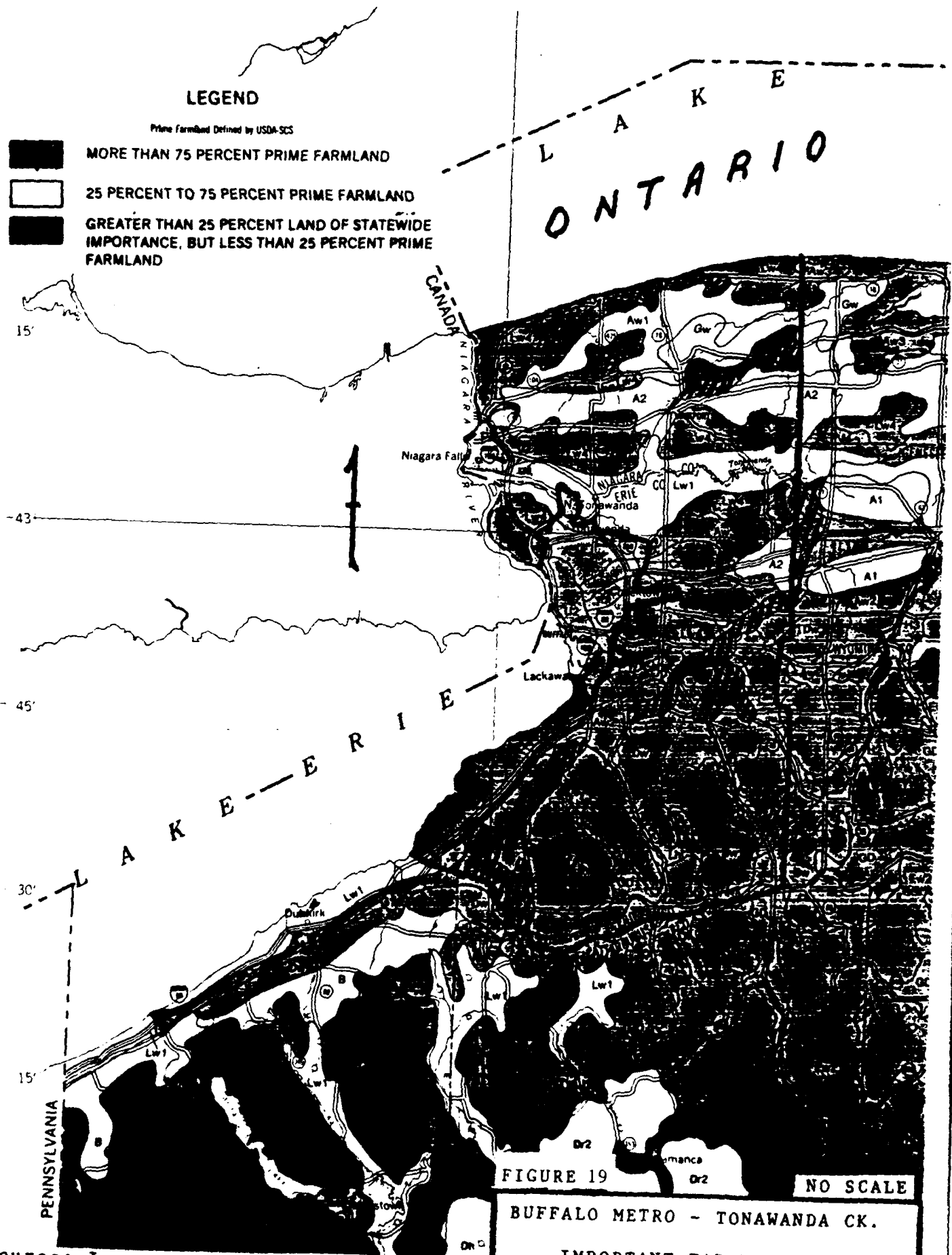
72 **White** **Residential**

12 **R** Outdoor Recreation

FIGURE 18

BUFFALO METRO - TONAWANDA CK
PRIMARY & SECONDARY LAND USE
NORTHERN ERIE COUNTY
(AMHERST & CLARENCE)

USA CORPS OF ENGINEERS
BUFFALO DISTRICT



Source: Important Farmlands of New York
U.S. Department of Agriculture
Soil Conservation Service

EIS-43

FIGURE 19

NO SCALE

BUFFALO METRO - TONAWANDA CK.

IMPORTANT FARMLANDS
ERIE AND NIAGARA CO.S N.Y.

USA CORPS OF ENGINEERS, BUFFALO

ERIE COUNTY NEW YORK

HATHORN NC81M-3

17 OCT 88 10 49

78 27 43 04

30 30 30 30 30 30

37 30'

40' 45'

45'

45'

30'

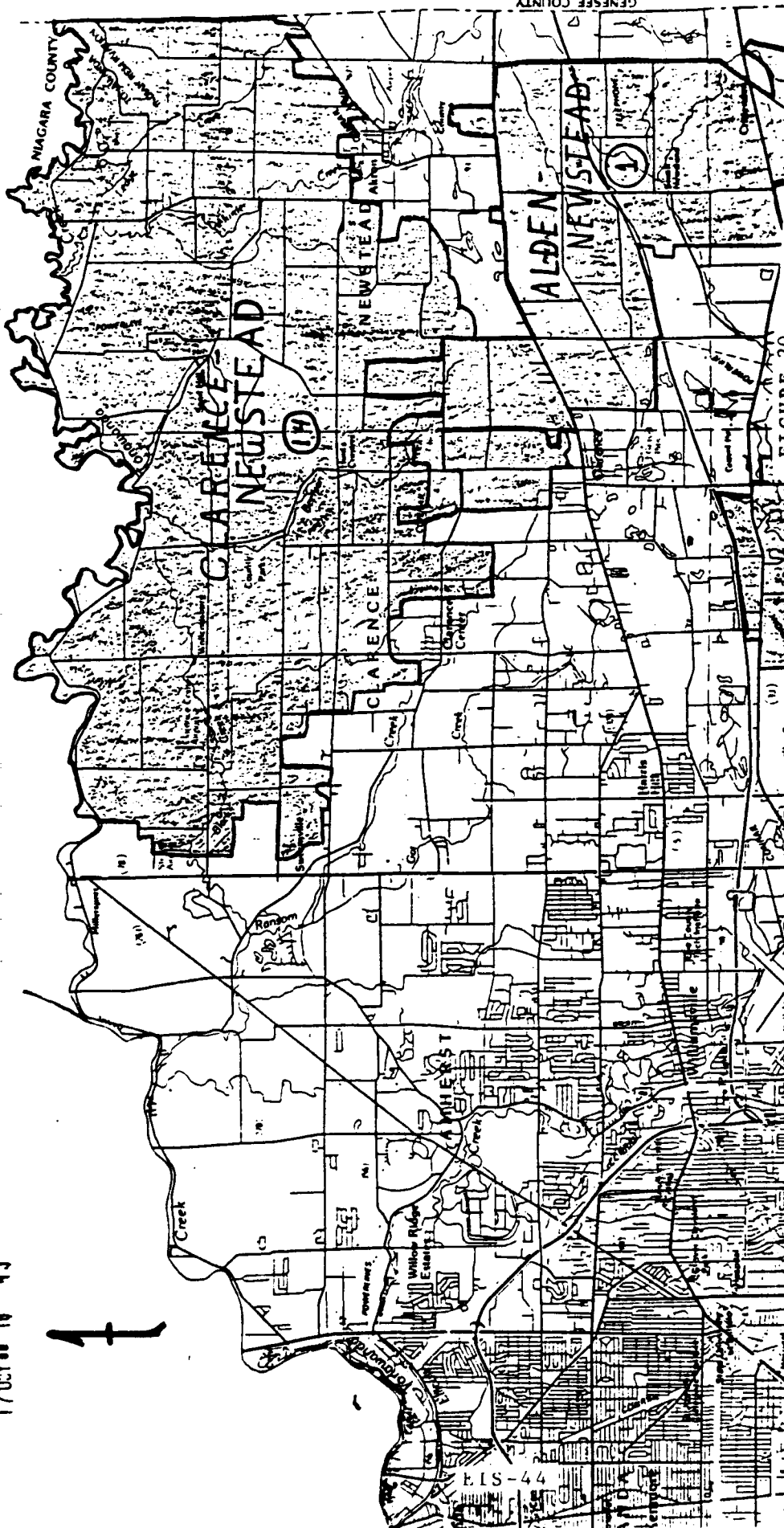


FIGURE 20

BUFFALO METRO - TONAWANDA CK.

AGRICULTURAL DISTRICTS
NORTHERN ERIE COUNTY

USA CORPS OF ENGINEERS, BUFFALO

Source: U.S. Dept. of Agriculture
Soil Conservation Service
East Aurora Field Office

EIS-44

kidney shell (Ptychobranhus fasciolaris), three-ridge (Amblema plicata), wabash pigtoe (Fusconaia flava), pink heelsplitter (Potamillus alatus), black pondshell (Ligumia recta), pink papershell (Potamilus laevis), and rainbow (Villosa iris).

HUMAN (MAN-MADE) RESOURCES

3.20 Community and Regional Growth.

3.21 Population - Table 3 depicts existing and anticipated population figures for the Lower Tonawanda Creek project vicinity. Reference Figures 1 and 14 also.

Table 3 - Population and Change

Place	Year									
	1980	1985	1990	2000	2010					
Niagara County	227,354	217,263	217,257	221,589	223,962	+				+
Wheatfield (T)	9,609	9,200	9,150	9,450	9,550	+				+
N. Tonawanda (C)	35,760	34,150	34,500	35,400	35,800	+				+
Pendleton (T)	4,726	4,500	4,750	5,000	5,050	+				+
Lockport (T)	12,942	12,350	13,650	15,600	15,800	+				+
Lockport (C)	26,844	23,750	23,500	23,550	23,850	+				+
Royalton (T)	7,765	7,400	7,650	8,300	8,400	+				+
Erie County	1,015,472	991,748	983,773	987,749	984,665	+				-
Tonawanda (T)	91,269	87,000	84,100	79,650	79,450	-				-
Tonawanda (C)	18,693	17,650	16,900	15,700	15,650	-				-
Amherst (T)	108,706	113,200	119,550	132,150	131,750	+				-
Clarence (T)	18,146	18,050	18,250	19,100	19,050	+				-
Newstead (T)	7,231	7,250	7,400	7,800	7,750	+				-
Buffalo (C)	357,870	335,200	318,050	302,500	301,600	-				-

SOURCE: Population Projections, New York State Water Quality Management Plan, New York State Department of Environmental Conservation, 1985. (C - City, T - Town)

3.22 Land Use and Development - Major community developments in the project vicinity as depicted on Figures 17 and 18 include the cities of North Tonawanda and Tonawanda near the mouth of the creek at the Niagara River, Ransom Oaks in Amherst at the confluence of Ransom and Black Creeks, Lockport located north along the Barge Canal, and the development at Rapids located along the main stem of the creek. Numerous residential and other developments also exist along the roads which parallel the creek and along the roadways which traverse the more developed townships. The most developed Buffalo suburban townships in the project vicinity include: Wheatfield (N. Tonawanda), Lockport (Lockport), Tonawanda (Tonawanda), Amherst, and Clarence. Substantial development is expected to continue.

3.23 Reference Figures 17, 18, 19, and 20 depict general development and land use characteristics in the likely primary project impact vicinity. Most of the upstream creek and tributary embankments are aligned with mature tree and shrub vegetation. Upland use is roughly 46 percent active or inactive agricultural, 30 percent wooded, 13 percent water or wetland, 1 percent recreation, and about 10 percent urban, commercial, residential, transportation, and communication. As depicted on Figures 19 and 20, most of the area is 25 to 75 percent prime farmland, but with wetness limitations. Large areas in Clarence have been designated as agricultural districts. There is a movement in Amherst to designate agricultural districts in the near future.

3.24 Floodplain Management - The townships which are located in the project vicinity participate in the regular program of the National Flood Insurance Program administered by the Federal Emergency Management Agency. By this stage, flood insurance and flood plain management maps have been developed and local ordinances pertaining to new or redevelopment in the 100 year event flood plain and flood protection to the intermediate regional or 100-year flood level have been enacted. In this way, flood insurance would help to compensate residents for flood damages to existing developments, while flood plain development ordinances would reduce the potential of flood damage of any future developments or redevelopments.

3.25 Business/Industry and Employment/Income - The following regional information pertains to that for Niagara and Erie Counties.

3.26 In 1984, there were some 22,372 business establishments in the Niagara-Erie two-county area. Most of these establishments pertained to wholesale/retail businesses (37%) and service industries (33%) followed by: transportation, public utilities, finance, insurance, real estate (11%), construction (10%), and manufacturing (7%).

3.27 In 1984, of the 527,000 labor force (covered by unemployment insurance) in the Niagara-Erie two-county area, 91 percent were employed. The leading employment sectors included: manufacturing (28%), services (27%), and retail (23%) followed by: wholesale (6%), finance, insurance, real estate (6%), transportation, communication, public utilities (6%), construction (4%), and all others (1%). Major manufactured goods include: transportation equipment, machinery, metal products, printing and publishing, food and kindred products, and chemical and allied products.

3.28 The 1983 per capita income for the Niagara-Erie two-county region was about \$11,329.

3.29 Generally, moderate growth in business, employment, and income is anticipated for the region.

3.30 Ransom Creek runs through the Ransom Oaks residential development and the quality (Trent Jones designed) Glen Oaks golf course.

3.31 Recreation. The project vicinity provides a diversity of recreational opportunities including: boating, fishing, swimming, biking, hiking, golfing, and relaxing in the park. Anticipate regional increased demands include those for facilities for boating, swimming, biking, hiking, golfing, and relaxing in the park (NYS - Statewide Comprehensive Recreation Plan).

3.32 Ransom Creek runs through the Ransom Oaks residential development and the quality (Trent Jones designed) Glen Oaks golf course.

3.33 Public Facilities and Services.

3.34 Water Resource Facilities - The municipal water supplies in the project vicinity generally obtain their water supply from the Niagara River. A number of community sewage treatment plants discharge their treated effluence into Tonawanda Creek or tributaries. Rural residents generally obtain their water supply from ground wells (the water table is generally high and close to the surface) while their sewage systems are septic.

3.35 Pipeline - A major gas pipeline and brine pipeline pass through the project vicinity as shown on Figure 17. An additional gasline to parallel the existing pipeline is under consideration.

3.36 Transportation - The lower portion of Tonawanda Creek serves as part of the New York State Erie Barge Canal. This section extends from the Niagara River up Tonawanda Creek to Pendleton; where the creek goes east while the canal goes north to Lockport and then east. A canal control guard gate is located just north of Pendleton. The canal system extends across the State from Buffalo to Albany and from Lake Champlain to the Hudson River. It was developed in the 19th Century. While some commercial vessels may use sections of the system, it is now used primarily by recreational vessels.

3.37 The primary project impact area is located just north of Buffalo and the New York State Thruway. Major roads passing through the area include: New Road, Millersport Highway, Transit Road, Westphalinger Road, Northfield Road, and Goodrich Road (North and South), and North Tonawanda Creek Road, Tonawanda Creek Road, Wolcott Road, Smith Road, North French Road, and Lapp Road (East and West). Route 990 connects the Thruway to North French Road. Reference Figure 17. Construction of an extension of Route 990 to cross Ransom Creek and connect Millersport Highway is underway. Widening of Millersport Highway is in the planning process.

3.38 Police and Fire Protection - The project area police district is serviced by the village and town police. These services are also supplemented by the County Sheriff's Department and the New York State Police. Similarly, the immediate project area fire district is serviced by the village and town fire department. Generally, existing services are considered good. Further development is generally determined by additional demands, availability of resources, and the ability of the community to meet the demands.

3.39 Property Value and Tax Revenues. The average value of farmland (land and buildings) for Erie and Niagara Counties is roughly estimated at \$2,000 per acre. An average median value of homes (house and lot) in Erie and Niagara Counties is roughly estimated at \$85,800. Tonawanda, Amherst, and Clarence are major development areas for the Buffalo Metropolitan area. Land and property values in these areas are multi-increased over average values accordingly. Local tax revenues generally include revenue sharing (Federal, State, local), and local property, service district, and sales taxes.

3.40 Noise and Aesthetics. No significant adverse noise problems or sources were noted in the immediate project study area. The major sources of noise is generated from the movement of vehicular traffic along the major thoroughfares. The creek area is generally aesthetically pleasing. The stream banks contain mature trees and vegetation. Most shoreline residences are in relatively close proximity to the creek and are generally well kept. Upland areas are generally a mix of open, wooded, agricultural, or sub-division housing developments. Commercial areas are generally concentrated along major thoroughfares.

3.41 Community Cohesion. Developments in the primary project impact area (primarily Amherst and Clarence) are both old and new. Development pressure in this area is high. Concerns associated with development is not uncommon. Issues dealing with development and open spaces are expected to increase.

3.42 To date, the State and local interests are supportive of investigations of potential flood damage reduction measures. Ideas on problems and solutions however, are not always consistent.

CULTURAL RESOURCES

3.43 Cultural Resources. The New York State Office of Parks, Recreation, and Historic Preservation indicated in a scoping letter response that the project area is archeologically sensitive and that appropriate cultural resource investigations should be conducted and coordinated prior to any project implementation. Subsequently a cultural resources survey was contracted and likely potential project impact areas were investigated. Several areas of potential cultural resources significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to any project construction.

SECTION 4 - ENVIRONMENTAL EFFECTS

INTRODUCTION

4.01 This section briefly compares anticipated environmental effects of the most reasonable alternative plans relative to various environmental assessment evaluation parameters and without project conditions. It describes in more detail, the anticipated impacts identified in Table 2 - Comparative Impacts of Alternatives in Section 2 - Alternatives.

NATURAL RESOURCES - ENVIRONMENTAL EFFECTS

4.02 Air Quality

4.03 No Action (Without Project Conditions). This alternative implies that no action would be taken by the Federal Government to construct a project. Ambient air quality in the general vicinity of Tonawanda Creek, Ransom Creek, and Black Creek would remain basically unchanged in the short-run, and may be further upgraded in quality in the long-run, if Federal, State and county air quality standards and monitoring techniques are refined and advanced in the future.

4.04 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Utilization of heavy equipment during initial project construction and future maintenance periods along Ransom Creek would create temporary localized noise and some smoke, odor, fugitive dust, carbon dioxide, and carbon monoxide emissions, that would contribute to short-term degradation of air quality, until the project was completed in about one construction season.

4.05 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The type and extent of impacts on air quality described for Ransom Creek in Plan 4 would also apply to the Ransom Creek portion of the Plan 11 alternative, except that the impacts on air quality would occur over a longer period of construction time. It would take about two construction seasons to complete the project, unless more construction equipment was utilized to shorten the time period for the project. Use of more construction equipment would temporarily increase the overall amount of noise, smoke, odor, fugitive dust, carbon monoxide, and carbon dioxide emissions.

4.06 Water Quality

4.07 No Action (Without Project Conditions). This action implies that no action would be taken by the Federal Government to construct a project. Ambient water quality in Tonawanda Creek, Ransom Creek, and Black Creek would remain basically unchanged in the short-run, and may eventually be further upgraded in the long-run if Federal, State and county water quality standards and monitoring improvement occur in the future.

4.08 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Disruption of silt, sediment, and detritus, with a resultant temporary increase in turbidity due to suspension of such material into the water column caused by construction work involving clearing and snagging, creek diversion (west of Hopkins Road) and channelization will temporarily contribute to existing water

turbidity in Ransom Creek during initial construction and during future maintenance periods. Such turbidity would further temporarily reduce water clarity and light penetration in the vicinity of the project site, as well as to some degree downstream during construction, until material suspended in the water column settled out. Some minor amount of oil and/or grease spillage during operation of heavy construction equipment may occur. However, in order to help minimize or avoid such potential adverse impacts on water quality, the Contractor would be required to comply with Federal and State water quality laws and regulations, as well as take appropriate precautions to prevent such spillage. Also, the Contractor would be required to follow the Civil Works Construction Guide Specification on Environmental Protection relative to water quality (CW-01430 dated July 1978).

4.09 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The type and extent of temporary short-term adverse impacts on water quality described for Ransom Creek in Plan 4 would also apply to the Ransom Creek portion of the Plan 11 alternative. However, in Plan 11, water quality in Tonawanda Creek would also be temporarily adversely impacted by construction of structural measures involving more extensive clearing and snagging (including some additional clearing and snagging on Ransom Creek), channel deepening shaping of bank slopes, and stone riprap installation where required. Similar precautions to reduce or avoid adverse impacts on water quality from minor equipment discharges as described for Plan 4 would be required of the Contractor. Soils disturbed by construction would also be promptly seeded to reduce or prevent surface runoff of silt and sediment into the creek to help decrease water turbidity. Although the creeks in the project area are considered to be warmwater streams, riparian vegetation removal along selected portions of the creek banks, could contribute to some minor to moderate warming of creek water, by removal of bank shade at project site locations.

4.10 Benthos.

4.11 No Action (Without Project Conditions). Since no Federal action to construct a project would occur with this alternative, there would be no impact due to such construction on the existing benthic organism community in Tonawanda Creek, Ransom Creek, and Black Creek. If at some time in the future, the creek environments are significantly altered by natural and/or man-made influences, the benthic habitat and its associated aquatic invertebrate organism communities would probably be correspondingly influenced by such changes.

4.12 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. If about 8,229 linear feet of Ransom Creek is channelized, approximately 10.7+ acres of existing benthic habitat in the creek would be significantly disrupted by channelization and creek diversion construction. If the existing channel in Ransom Creek was diverted westward over a distance of about 3,200 linear feet, around 3.2+ acres of new benthic habitat would be created in the channel of Ransom Creek where the creek was widened by excavation. New habitat for benthic organism recolonization would also be available wherever channelization occurred in the creek. Of the 10.7+ acres of benthic habitat disrupted, about 2.5+ acres of existing creek benthic habitat would be filled-in, and therefore

permanently lost as aquatic habitat for use by benthic invertebrates. Selective clearing and snagging in and/or along Ransom Creek, over an approximate length of 10,887 linear feet of stream, as well as about 446 linear feet in Black Creek, would further disrupt or destroy existing benthic habitat and invertebrates, during removal of any fallen trees, submerged snags, channel debris or other impediments to flow, as well as by creating temporary additional short-term water turbidity that may aggravate invertebrate breathing organs. Some invertebrates would be smothered as suspended materials settled out from the water column downstream. Benthic organisms surviving at the project site, as well as such organisms that invaded the project zone from nearby creek areas, would tend to soon recolonize the disrupted aquatic substrate zones.

4.13 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The type and extent of impacts on benthic habitat and invertebrate organisms described for Ransom Creek in Plan 4 would also apply to the Ransom Creek portion of the Plan 11 alternative. However, in Plan 11, benthos in Tonawanda Creek would also be adversely impacted by construction of structural measures involving more extensive clearing and snagging, channel deepening, shaping of bank slopes, and installation of stone riprap, that would disrupt the existing aquatic environment. Bank sloping would disrupt about 1.1+ acres of benthic habitat, whereas channel deepening, - leaving existing sideslopes undisturbed as much as possible - could disrupt an estimated 3.8+ acres of benthos. Approximately 0.1+ acres of benthos would also be disrupted by installation of stone riprap - some benthic invertebrates would be physically removed and destroyed during bank excavation and shaping, as well as by stone placement. Selective snagging and clearing over a long stretch of Tonawanda Creek (approximately 20,500 linear feet of creek), as well as over more of Ransom Creek, would cause increased localized disruption of benthos, by increasing turbidity, agitation of water and bottom substrate, wherever snags, trees, and other obstructions to stream flow are removed from the aquatic environment.

4.14 Fisheries

4.15 No Action (Without Project Conditions). Since no Federal action to construct a project would occur with this alternative, there would be no impact due to such construction on existing fisheries in Tonawanda Creek, Ransom Creek, and Black Creek, unless the aquatic environment was significantly altered by natural influences or by some man-made development disruption in the future.

4.16 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. This plan would essentially involve channelization, clearing and snagging on Ransom Creek, as well as possibly some diversion of this waterway in the general vicinity of Hopkins Road in the town of Amherst, which would result in significant adverse impacts on the Creek's aquatic bed and riparian corridor. Stream shading and diversity of in-stream habitat would be significantly reduced in the lower reaches of Ransom Creek, which serves as a migration corridor for spawning northern pike and juvenile pike that are emigrating from nursery habitat in the upper reaches of this creek. Channelization and channel diversion would significantly alter fish habitat over about 1.7+ miles of Ransom Creek (10.7+ acres), by excavation of creek substrate and widening of the

channel. Although the channel would still provide habitat to some degree for fish, diversity of the channel bed would be significantly decreased and riparian cover would be eliminated or reduced in density where such construction occurred. Existing riparian vegetation within the 8,829 linear feet of channelized zone, and where selective clearing and snagging was done within a creek zone of about 10,887 linear feet in length, would be destroyed. This would reduce diversity of vegetation providing shade to the creek, and possibly contribute to some increase in water temperature in the creek - especially where overhanging vegetation and in-stream snags are eliminated. Removal of such vegetation would also contribute toward a reduction in leaf litter and falling insects off such overhanging trees, that contribute to the fish food chain in the creek. Channelization would disrupt and destroy existing benthic organisms in the general project locale that also contribute to the food chain of fish in the creek. Channelization would also reduce creek bottom roughness and variation for use as fish habitat, and would shorten the length of the natural creek to some degree. Construction activity that disrupts the water regime in the creek would cause fish to temporarily avoid the immediate work area. The temporary increase in water turbidity may temporarily aggravate fish gill systems until construction disturbances ceased and turbidity decreased. Diversion of Ransom Creek for approximately 3,200 linear feet would destroy about 3.2+ acres of existing fish habitat due to excavation and filling, as well as destroy benthic food organisms in the general vicinity where such work was done. Approximately 0.8+ acres of new fish habitat (aquatic and riparian) would be created by diversion of the Creek, but such habitat would be less diverse and unshaded. Both channelization and creek diversion would alter current velocity and flow patterns, which could influence fish utilization of the creek in the vicinity of the project site, by altering feeding, hiding, spawning, and nursery habitat for game fish and forage fish.

4.17 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The type and extent of impacts on fisheries in Ransom Creek described in Plan 4 would also apply to the Ransom Creek portion of Plan 11. However, since Plan 11 includes channel deepening in Tonawanda Creek, an additional 5.8 acres of fish habitat would be severely disrupted by such construction work. Installation of stone riprap would disrupt about 0.2 more acres of fish habitat on Tonawanda Creek and the extensive selective snagging and clearing where needed over about 20,500 linear feet of this creek, would significantly increase the amount of potential in-stream and riparian habitat disruption to fisheries. The Clarence Diversion Channel and associated system of collector ditches would diminish flows into Black Creek during flooding periods, by temporarily reducing flow of floodwaters to the creek, otherwise, normal creek flows would continue to occur.

4.18 Wildlife

4.19 No Action (Without Project Conditions). Since no Federal action to construct a project would occur with this alternative, no construction related impacts on terrestrial or aquatic wildlife habitat and associated mammal, bird, reptile, and amphibian wildlife would be anticipated. Transient, seasonal and endemic (native) wildlife such as waterfowl, mink muskrat, raccoons, wading birds, predatory birds, and passerine birds would continue to utilize the habitats along Tonawanda Creek, Ransom Creek, and Black Creek, unless at some

time in the future environmental conditions were significantly altered by natural and man-made changes that could adversely influence use of these habitats by wildlife.

4.20 Local Ransom (Oaks) Creek Channel Modifications. Channelization would destroy about 14.5+ acres of existing aquatic/riparian corridor wildlife habitat along Ransom Creek. Diversion of this creek from about 3,200 linear feet would also destroy about 2.5+ acres of additional terrestrial wildlife habitat. Approximately 0.8+ acres of new terrestrial herbaceous wildlife habitat may be created by earth filling along the east bank of Ransom Creek, but such habitat would be less diverse and more open. Vegetation in this new habitat zone would primarily be maintained in a seeded grass/legume mixture containing only several species of plants. Also, selective clearing and snagging would destroy or disrupt additional riparian wildlife habitat along the creek, wherever trees, shrubs, stumps, and herbaceous vegetation providing potential flood, cover or nesting habitat is removed. About 20 acres of terrestrial wildlife habitat at a town of Amherst Site (located at the northeast corner of Millersport Highway and Smith Road) would be destroyed by deposition of excavated material from the project. Although the site would be graded and seeded, it is anticipated that native vegetation would also reestablish to some degree. Some small species of wildlife (i.e., mice, voles, moles, amphibians, reptiles) may be unavoidably destroyed during project construction and soil deposition. Although most wildlife would tend to leave and avoid the immediate project site until construction disturbances ceased, some young wildlife may be destroyed during operation of heavy equipment or by earth excavation and filling.

4.21 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The type and extent of impacts on wildlife in the vicinity of Ransom Creek as described for Plan 4 would also apply to the Ransom Creek portion of the Plan 11 alternative, except that the town of Amherst site at the northeast corner of Millersport Highway and Smith Road would not be filled with excavated material from the project. However, since Plan 11 has additional structural project measures, more wildlife habitat would be adversely affected. In Plan 11, the proposed 800-foot long terrestrial cut-off channel (between Ransom Creek and Smith Road in the town of Amherst) would destroy about 1.5 to 2.0 acres of openland wildlife habitat. Removal of riparian vegetation would interrupt the continuum of the riparian vegetation corridor along the Creek, which provides a travel levee for wildlife near developed areas. Selective snagging and clearing along Tonawanda Creek over a distance of about 20,500 linear feet (from its mouth upstream to approximately Westphalinger Road) would disrupt more terrestrial riparian wildlife habitat and possibly some aquatic wildlife habitat (wherever trees, stumps or debris are removed from the water). Bank sloping construction would disrupt about 2.0 acres of existing riparian habitat on Tonawanda Creek, and installation of riprap stone would destroy about 0.2 acres more of such existing habitat. Where about 3,825 linear feet of channel deepening is proposed on Tonawanda Creek, some limited riparian habitat disruption may occur along the adjacent creek banks. A significant adverse impact on terrestrial wildlife habitat (containing a variety of tree - shrub - herbaceous vegetation successional fields) will be incurred by construction of the proposed 13,300 feet long Clarence diversion channel. It would directly destroy about 99+ acres of food, cover, nesting and rearing habitat for wildlife - within which would be included about 3.0+ acres of

semi-permanent deciduous tree/shrub swamp wetland, that would be excavated out by construction of the diversion channel on the north side of Sesh Road. Although soil types on lands peripheral to the proposed Clarence diversion channel are silt loam to clay loam in texture, range from somewhat poorly to very poorly drained, contain a seasonally high water table, and vary in permeability from slow to moderately slow, there is still a possibility that some degree of subsurface drainage into the Clarence Diversion Channel may occur from nearby lands, if permeable sandy soil seams are present in the substratum of soil types that are connected to and exposed by the diversion channel cut. If improved drainage from nearby upland and wetland areas is influenced by the Clarence Diversion Channel, some additional semi-permanent deciduous tree/shrub swamp wetland wildlife habitat and upland habitat, would probably eventually be converted to plants that are indicative of drier soil conditions that favor upland wildlife. The magnitude of any such potential drainage on lands in the general vicinity of the Clarence Diversion Channel would have to be further evaluated during the design phase of the Plan 11 alternative. Deposition of excavated material from all project construction onto terrestrial openland located on the south side of the proposed Clarence Diversion Channel (between Westphalinger Road and Northfield Road) would destroy about 184.4+ acres of wildlife habitat, that would further decrease habitat diversity. In order to help mitigate the adverse impact on loss of existing riparian habitat to wildlife, at least to some degree, disturbed soils in the project locale would be promptly seeded to a grass/legume herbaceous mixture, and planted with deciduous or evergreen trees and/or shrubs wherever it is feasible to do so. However, the construction actions would decrease habitat diversity in the short-run, as well as the long-run, even though it is expected that eventually some native plant species will reinvade the disturbed soils, unless further development occurs. Reseeding the Diversion Channel, spoil deposition area and cut-off channel would provide long-term openland terrestrial wildlife habitat over about 304+ acres. Some scattered shrubs and/or trees may also be planted in the spoil deposition area.

4.22 Vegetation

4.23 No Action (Without Project Conditions). This alternative implies that no action would be taken to construct a project. In the short-run no significant alteration of existing plant communities in the riparian corridor of Tonawanda Creek, Ransom Creek, or Black Creek would probably occur. In the long-run, continuous encroachment by development and more intensive human recreational use of the aforementioned creeks, will likely influence the riparian vegetation continuum along these waterways, as well as on upland areas presently established with woody and herbaceous plants.

4.24 Local Ransom (Oaks) Creek Channel Modifications. Since aquatic plants are not common in the immediate vicinity of the Ransom Creek project sites (i.e., some scattered bulrush, sedges, and filamentous algae), no significant adverse impact on such vegetation is anticipated. However, channelization and work associated with diverting the creek would destroy existing riparian vegetation (woody and herbaceous) wherever bank filling or bank excavation occurred. Channelization and creek diversion would destroy riparian vegetation within about a 17+ acre area where such structural measures would be implemented. Clearing and snagging over about 4,338 linear feet of creek upstream of the potential channelization zone, would destroy additional

riparian vegetation, but on a more selective basis, wherever obstructions to flow - both in and out of the water - would require removal. About 20 acres of terrestrial openland vegetation would be destroyed by deposition of material excavated to construct the project. The spoil would be deposited at the town of Amherst's 87 acre site located in the northeast corner of Millersport Highway and Smith Road.

4.25 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The type and extent of impacts on vegetation in the vicinity of Ransom Creek as described for Plan 4 would also apply to the Ransom Creek portion of the Plan 11 alternative, except that the town of Amherst's 20 acre site indicated above would not be used. However, Plan 11 has additional structural project measures that would adversely impact more vegetation. Since aquatic plants are sparse at potential construction sites in both Ransom and Tonawanda Creek, no significant adverse impact on submerged, floating or emergent aquatic plants is anticipated. Selective snagging and clearing over approximately 20,500 linear feet of Tonawanda Creek, as well as over an additional length of Ransom Creek (about 3,350 feet more) would destroy more riparian vegetation than would Plan 4. Construction work associated with installation of stone riprap, and bank sloping would disrupt another 2.3+ acres of riparian vegetation. Some limited vegetation disruption on the Tonawanda Creek banks may also occur in the vicinity of channel deepening. A significant adverse impact on the variety of plant community vegetation in early, mid, and late upland plant successional fields, as well as to some degree in woodland and wetland areas would occur by installation of the lengthy, deep, broad Clarence diversion channel. Excavation of this major overflow channel would directly destroy about 99+ acres of vegetation - within which would be included about 3.0+ acres of semi-permanent deciduous hardwood tree/shrub swamp wetland, as well as a variety of trees, shrubs, forbs, and grasses on poorly drained soils of upland areas. Deposition of excavated material from all project construction would destroy about 184.4+ acres of terrestrial vegetation consisting of young trees, shrubs, grasses, and forbs. in an area where soils are classified as being prime farmland soils. Construction of shallow collector ditches east of Goodrich Road in the general vicinity of upland wooded - shrub - idle openland areas would destroy approximately 1 acre of mid to late successional field vegetation containing scattered young hardwood trees (i.e., red maple, ash, elm), shrubs (dogwood, viburnum) and a variety of typical forbs and grasses.

4.26 Wetlands

4.27 No Action (Without Project Conditions). Since no Federal action would occur to construct a project with this alternative, there would be no construction impact on wetlands in this regard. In the short-run, no significant alteration of existing wetlands in the study area is anticipated. In the long-run, natural or man-made influences such as eventual plant succession or development could alter or destroy some wetland areas, unless continued protective and/or management measures are taken to maintain this resource.

4.28 Local Ransom (Oaks) Creek Channel Modifications. There are no wetlands in the near vicinity of Ransom Creek where channelization, selective clearing and snagging, or channel diversion measures are planned for this alternative. Therefore, no significant adverse impact on wetlands would be anticipated if this alternative was implemented.

4.29 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. There are two Class 2 significant palustrine semi-permanent wetlands located on the north side of Sesh Road in the town of Clarence, that could be adversely impacted by construction of the Clarence diversion channel. The NYSDEC wetland map for this locale identifies both wetlands as being predominantly deciduous tree-shrub swamps. One wetland, identified by the symbol CC-37 on the NYSDEC wetland map, is estimated to be about 28 acres in size, whereas the other wetland identified by the symbol CC-43 is about 53 acres in size. Soil types and soil drainage in the general vicinity of these wetlands range from somewhat poorly drained Swormville clay loam to poorly drained Canandaigua silt loam, as well as Getzville silt loam which is poorly to very poorly drained. There is also some Niagara Silt loam which is somewhat poorly drained. The Soil Survey Report of Erie County, New York (1986) indicates that for these soil types, permeability in the surface layer varies from moderate or moderately slow to slow, and that an annual seasonally high water table is present from about November through May or June. The substratum of soil types such as Getzville may contain small intermingled soil types that contain sand. The smaller of the two aforementioned wetlands would be directly adversely impacted at its southernmost end by construction of the diversion channel, whereby about 3.0 acres would be destroyed by excavation. Also, some additional subsurface drainage lateral to the diversion channel may occur, that could further influence drainage of this wetland, as well as to some degree the larger wetland unless precautionary engineering measures are taken to preclude such potential subsurface drainage. Construction of the Clarence diversion channel may also cut-off some surface water drainage north of the larger wetland area. A determination of the extent of such impacts on surface and subsurface drainage to these wetlands would have to be further evaluated during the preconstruction, engineering, and design phase. Wetland lost by excavation of the diversion channel would be replaced to achieve no net loss as determined during further coordination with the NYSDEC and U.S. Fish and Wildlife Service, if project planning continues.

4.30 Threatened/Endangered/Rare Species

4.31 No Action (Without Project Conditions). Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service are known to exist in the study area of Tonawanda, Ransom, and Black Creeks (Reference: U.S. Fish and Wildlife Coordination Act Report, 1989). Species identified by NYSDEC as threatened or rare would not be adversely impacted, since no Federal action would occur with this alternative.

4.32 Local Ransom (Oaks) Creek Channel Modifications. Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service are known to exist in the Ransom Creek project locale. The threatened long-eared sunfish, rare brindled madtom fish as well as several species of shellfish (clams) in

Tonawanda Creek addressed in Section 3 - "Affected Environment" of this Environmental Impact Statement, would not be adversely impacted, since structural measures for this alternative would be confined to the immediate vicinity of Ransom Creek.

4.33 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Except for occasional transient individuals, no Federal listed or proposed endangered or threatened species under jurisdiction of the U.S. Fish and Wildlife Service are known to exist in the potential project area. However, with regard to NYSDEC identified threatened species (including species identified as being "rare" by the New York Heritage Program), aquatic habitat disruption by construction associated with bank sloping, clearing and snagging, installation of stone riprap, and channel deepening at selected locations along Tonawanda Creek, would adversely alter aquatic habitat that may potentially be utilized by the long-eared sunfish, as well as the rare brindled madtom fish and some rare invertebrate species of shellfish (clams). Dredging associated with channel deepening over approximately 3,825 linear feet of Tonawanda Creek, would probably have the most significant potential adverse impact on alteration of habitat of the aforementioned species. Dredging may even destroy some of the rare invertebrates by physical removal and displacement of substrate out of the aquatic environment. Deposition of stone riprap below the waterline could also crush some of these invertebrates. Settlement of silt, sediment, and detritus from the turbid water column may smother some organisms, or temporarily aggravate their water exchange/filtration systems.

HUMAN (MAN-MADE) RESOURCES - ENVIRONMENTAL EFFECTS

4.34 Community and Regional Growth

4.35 The following sections relate to community and regional growth effects.

4.36 Population (Displacement of People), Land Use and Development (Displacement of Farms).

4.37 No Action (Without Project Conditions). The project impact area (primarily the towns of Amherst and Clarence) is a suburban growth area in the Buffalo Metropolitan area. Associated population growth and development is expected to continue for some time in the future. Similar to existing flooding conditions with periodic temporary displacement of people from homes and businesses and associated flood damages would be expected. The existing project area 100 year event floodplain is about 16,700 acres. Reference Figure 2.

4.38 New and redevelopment in floodplain areas are subject to building codes associated with the National Flood Insurance Policy Act requiring flood protection up to the 100 year event flood level. Additionally, flood insurance or acceptable flood protection is required by banks providing mortgages for developments acquired in a floodplain area. Development in existing non-floodplain areas therefore, may be easier and more desirable than development in floodplain areas depending on balance of costs and potential inconveniences.

4.39 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Implementation of this plan would require acquisition of a house near the Tonawanda-Ransom Creeks confluence in very close proximity to Ransom Creek, relocation of these residents, and acquisition of some 30 acres of land adjacent to Ransom Creek. Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging area (adjacent several acre site) then disposed of in accordance with the Contractor's approved disposal plan (i.e., permitted clean burn, firewood, landfill). Clean excavated earthen material (about CY) would be desposited on a nearby several acre field area; graded, and revegetated. At a minimum, acquisitions and relocations would be in compliance with guidelines established by the "Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970," as amended.

4.40 The project would provide 100 year event level flood protection to localized existing developments (primarily Ransom Oaks) from flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via Black Creek. The 100 year event level floodplain would not be altered significantly, and associated National Flood Insurance Policy regulations would remain in effect.

4.41 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Implementation of this plan would require acquisition of the house on Ransom Creek near Tonawanda Creek and houses on Tonawanda Creek Road, Northfield Road, and Goodrich Road on the diversion channel alignment; relocation of residents; and acquisition of some 140 acres of land adjacent to lower Tonawanda Creek (about 20 acres), Ransom Creek (about 30 acres), and along the diversion alignment (about 90 acres). Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging areas (several adjacent several acre sites) then disposed of in accordance with the Contractor's permitted disposal plan (i.e., permitted clean burn, firewood, landfill). Clean excavated earthen material (about CY) would be deposited on a 185 acre field area located adjacent to the proposed Diversion Channel, just south of the confluence with Tonawanda Creek. This would be graded several feet above existing ground level and expeditiously revegetated. At a minimum, acquisition and relations would be in compliance with guidelines established by the "Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970," as amended.

4.42 The project would provide 100 year event level flood protection to the floodprone Tonawanda, Black, and Ransom Creeks area generally west of Goodrich Road. Reference Figures 2 and 5. Associated periodic temporary displacement of people, disruption, and damages associated with creek flooding would be alleviated.

4.43 The 100 year event floodplain would be reduced in the protected area primarily to within the creeks and diversion embankments. The areas removed from the floodplain (about 10,800 acres) would no longer be subjected to National Flood Insurance Policy associated regulation. Although some development requirements and costs would be reduced, property values would likely increase slightly. Damages, disruptions, and insurance costs to existing floodprone developments would be substantially reduced.

4.44 The proposed diversion channel runs through the Clarence-Newstead agricultural district, an area of prime and unique and important agricultural soils, but limited by wetness. The diversion channel would occupy about 90 acres in this area; essentially removing that area from potential agricultural use. The disposal area would affect about 185 acres but could likely be utilized for agriculture. The channel could however, enhance the surrounding area for agricultural use with improved drainage to alleviate the soil wetness limitation. Some increased conflict of urban/rural use interests may occur due to flood protection and associated improved development potential of the area.

4.45 Business/Industry and Employment/Income

4.46 No Action (Without Project Conditions). Generally, moderate growth in business, employment, and income is anticipated for the region. As indicated previously, the project impact area is a suburban growth area in the Buffalo Metropolitan area. Residential, commercial, and industrial park type developments are expected to continue for some time in the future. These new developments are subject to National Flood Insurance Policy associated regulations.

4.47 Although most flood damages in the project area pertain to residential developments some pertain to associated commercial developments. Similar to existing flooding conditions with periodic disruptions and associated flood damages would be expected.

4.48 Farming is an important activity in the project vicinity, particularly in the fertile northern Clarence (Clarence-Newstead Agricultural District) vicinity; although soil wetness is a limiting factor. Crops include: hay, grain crops, and some truck crops.

4.49 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Project construction would provide short-term employment for a construction firm and a small work force of employees. Construction would likely be completed in one construction season.

4.50 Project construction would result in some disruption to normal use of the Glen Oaks golf course due to construction activities, and would alter the creek setting which runs through the course, to some degree.

4.51 The project would provide 100 year event level flood protection to localized existing developments (including some commercial) from flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via Black Creek. Associated reduction in flood damage and disruption would be expected. The 100 year event level floodplain would not be altered significantly.

4.52 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Project construction would provide short-term employment for one or more construction firms and associated work forces of employees. Construction would likely be completed in two or more construction seasons.

4.53 The project would provide 100 year event level flood protection to the floodprone Tonawanda, Black, and Ransom Creeks area (including a few commercial developments) generally west of Goodrich Road. Associated periodic flooding disruptions and damages would be alleviated.

4.54 Construction of the Clarence diversion channel would essentially remove about 90 acres of farmland from potential agricultural use. The channel could however, enhance the surrounding area for agricultural use with improved drainage to alleviate a soil wetness limitation. The 185 acre disposal site would be disrupted in the short-term, but could be utilized for agriculture in the long-term.

4.55 Construction of the Clarence diversion channel would result in some disruptions to normal use of the Greenwood golf course due to construction activities, and would alter the area terrain accordingly.

4.56 Reference statement of impacts for Plan 4, also.

4.57 Recreation

4.58 No Action (Without Project Conditions). Anticipated regional recreational demands include those for facilities for boating, swimming, biking, hiking, golfing, and relaxing in the park (NYS-Statewide Comprehensive Recreation Plan).

4.59 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Project construction would disrupt water quality, fishery resources, and associated fishing opportunities along Ransom Creek during project construction.

4.60 Project construction would result in some disruptions to normal use of the Glen Oaks golf course due to construction activities, and would alter the creek setting which runs through the course to some degree. A hiking/biking trail exists in the area of the golf course and residential development.

4.61 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Project construction would disrupt water quality, fishery resources, and associated fishing opportunities along the project portions of Tonawanda and Ransom Creeks during project construction.

4.62 Construction of the Clarence diversion channel would result in some disruptions to normal use of the Greenwood golf course due to construction activities, and would alter the area terrain accordingly.

4.63 The proposed project may provide some opportunity for demand recreational facility improvements along the creek and diversion channel.

4.64 Reference statement of impacts for Plan 4, also.

4.65 Public Facilities and Services

4.66 No Action (Without Project Conditions). Periodic flooding would continue to disrupt normal public facilities and services. Public facilities and

services would be needed to facilitate associated flood emergency operations. Sections of some roads would continue to be periodically inundated by floodwaters.

4.67 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Some public facilities and services may be utilized to facilitate project construction. At times, local police services may be required to facilitate traffic control and to patrol the area during project construction. Project area roads, primarily Tonawanda Creek Road, Hopkins Road, Smith Road, New Road, and/or Millersport Highway would be utilized to transport heavy construction equipment and excavated and fill material to and from the project area, and may suffer some wear and tear. Some minor relocation of utilities may be required to facilitate project construction, but no significant disruption of services would be expected. Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging areas (adjacent several acre site) then disposed of in accordance with the Contractor's approved disposal plan (i.e., permitted clean burn, firewood, landfill). Clean excavated earthen material (about CY) would be deposited on a nearby several acre field area; graded, revegetated.

4.68 With project completion, fewer public facilities and services would be required to facilitate flood emergency operations. Project maintenance however, would likely be a local responsibility.

4.69 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Some public facilities and services may be utilized to facilitate project construction. At times, local police services may be required to facilitate traffic control and to patrol the area during project construction.

4.70 Project area roads including the Tonawanda Creek Roads, New Road, Millersport Highway, Transit Road, Westphalenger Road, Northfield Road, Sesh Road, and Goodrich Road, and others could be utilized to transport heavy construction equipment and excavated and fill material to and from the project area, and may suffer some wear and tear.

4.71 Roads would need to be modified at their intersection with the diversion channel as described in the project description.

4.72 A gas pipeline(s) would need to be modified/relocated at the intersection with the diversion channel in the vicinity of Northfield Road. Additionally, some minor relocation of utilities may be required to facilitate project construction, but no significant disruption of services would be expected.

4.73 Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging areas (several adjacent several acre sites) then disposed of in accordance with the Contractor's permitted disposal plan (i.e., permitted clean burn, firewood, landfill). Clean excavated earthen material (about CY) would be deposited on a 185 acre field area located adjacent to the proposed Diversion Channel, just south of the confluence with Tonawanda Creek. This would be graded several feet above existing ground level and expeditiously revegetated.

4.74 With project completion, fewer public facilities and services would be required to facilitate flood emergency operations. Project maintenance however, would likely be a local responsibility.

4.75 This plan would require utilization of some diversion of high-flows down the New York State Erie Barge Canal. It is expected that this can be accomplished with minimal modifications and impacts to barge canal facilities, use, overflows, and environmental effects.

4.76 Reference statement of impacts for Plan 4, also.

4.77 Property Values and Tax Revenues

4.78 No Action (Without Project Conditions). The project vicinity is a major growth area in the Buffalo Metropolitan vicinity. Property values and associated tax revenues are relatively increased over average values. Values are slightly decreased in floodplain areas; however, construction and insurance costs are generally higher. Elevated values would be expected for some time in the future.

4.79 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Acquisition of properties and easements (about 30 acres) along Ransom Creek would be required for project implementation. Clean excavated earthen material (about CY) would be deposited on a nearby several acre field area; graded, and revegetated (Disposal Easement). Acquisitions would be converted to publically owned lands and taxed accordingly.

4.80 Acquisition of properties, at a minimum, would need to be accomplished in accordance with guidelines established by the "Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970," as amended.

4.81 The project would provide 100 year event level flood protection to localized existing developments (Ransom Oaks) from flooding from Ransom Creek but only up to 25 year event level flood protection from flooding from Tonawanda Creek via Black Creek. Some slight increase in property values and associated tax revenues could result. The 100 year event level floodplain however, would not be significantly altered and National Flood Insurance Policy associated regulations would remain intact.

4.82 Project costs would likely be shared among Federal, State, and local interests who would benefit by the project. Project maintenance would likely be a local responsibility.

4.83 Reference the Main Report and Cost and Economic appendices for more details on project costs and benefits.

4.84 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Acquisition of properties and easements along lower Tonawanda Creek (about 20 acres), the Clarence Diversion (about 90 acres), and along Ransom Creek (about 30 acres) would be required for project implementation. Clean excavated earthen material (about CY) would be deposited on a 185 acre field area located adjacent to the proposed Diversion Channel, just south of the

confluence with Tonawanda Creek. This would be graded several feet above existing ground level and expeditiously revegetated (Disposal Easement). Acquisitions would be converted to project lands and taxed accordingly.

4.85 Acquisition of properties, at a minimum, would need to be accomplished in accordance with guidelines established by the "Uniform Relocation Assistance and Real Properties Acquisition Policies Act of 1970," as amended.

4.86 The project would provide 100 year event level flood protection to the floodprone Tonawanda, Black, and Ransom Creeks area generally west of Goodrich Road. The 100 year event floodplain would be reduced in the protected area primarily to within the creeks and diversion embankments. The areas removed from the floodplain (about 10,800 acres) would no longer be subjected to National Flood Insurance Policy associated regulation. Protected property values and associated tax revenues would likely increase slightly.

4.87 Project costs would likely be shared among Federal, State, and local interests who would benefit by the project. Project maintenance would likely be a local responsibility.

4.88 Reference the Main Report and Cost and Economic appendices for more details on project costs and benefits.

4.89 Noise and Aesthetics

4.90 No Action (Without Project Conditions). With increased developments, associated increased noise levels and changed aesthetics would be expected.

4.91 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. Noise would be generated in the project vicinity along Ransom Creek due to operation of construction equipment during the construction period. Noise would also be generated along area roads by trucks moving excavated and fill material. Developments in the project area are primarily residential and a golf course. Construction would likely occur during working daylight hours. Construction equipment would be required to meet standard noise emission standards. All practical means would be employed to minimize adverse noise impacts. Associated scheduling and routing patterns shall be considered, as warranted.

4.92 The project area aesthetics along Ransom Creek would be altered during and after project construction. Although riparian vegetation would be retained to the degree possible for both aesthetic and fish and wildlife reasons, much of the vegetation along the creek banks would be removed so that the creek channel could be deepened and/or widened. Some turbidity and increased sedimentation into the creek would be expected due to the nature of stream modifications. Short reaches of modified stream embankments would be temporarily earthen or mulch protected until protective riprap is applied or replacement vegetation is established. Construction material would likely be stockpiled in the area until utilized. A 20 acre earthen material disposal area would be disrupted and altered by fill material but would appear more natural after revegetation. Some earthen material may be tracked on area roads. The creek channel would be larger and the creek area more open and less vegetated after project construction.

4.93 The project contractors would be required to comply with the Corps of Engineers Civil Works Construction Guide Specification entitled "Environmental Protection" (CW-01430, July 1978) which requires implementation of all practical measures to protect water and associated land resources from impacts such as noise, dust, pollution, turbidity, and erosion during project construction.

4.94 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. Noise would be generated in the project vicinity along lower Tonawanda Creek, the Clarence diversion channel, and Ransom Creek due to operation of construction equipment during the construction period. Noise would also be generated along area roads by trucks moving excavated and fill material. Developments in the project vicinity are primarily residential. Two area golf courses would also be affected. Construction would likely occur during working daylight hours. Construction equipment would be required to meet standard noise emission standards. All practical means would be employed to minimize adverse noise impacts. Associated scheduling and routing patterns shall be considered, as warranted.

4.95 The project area aesthetics along lower Tonawanda Creek, the Clarence diversion channel, and Ransom Creek would be altered during and after construction. Although riparian vegetation would be retained to the degree possible for both aesthetic and fish and wildlife reasons, much of the existing vegetation along the creek banks would be removed during clearing and snagging and so that the creek channel could be deepened and/or widened. Some turbidity and increased sedimentation into the creek would be expected due to the nature of stream modifications. Construction reaches of modified stream embankment would be temporarily earthen or mulch until protective riprap is applied or replacement vegetation is established.

4.96 Tree and shrub vegetation would be removed along the Clarence diversion channel alignment, and the relatively flat terrain would be altered to that of the diversion channel. Channel embankments would be temporarily earthen or mulch protected until protective riprap is applied or replacement vegetation (probably grass or legume) is established.

4.97 Clean excavated earthen material (about CY) would be deposited on a 185 acre field area located adjacent to the proposed Diversion Channel, just south of the confluence with Tonawanda Creek. This would be graded several feet above existing ground level and expeditiously revegetated. Some construction material may be spilled and/or earthen material tracked on area roads.

4.98 Generally the creek channels would be larger and the creek and diversion areas more open and less vegetated after construction (less natural). The relatively flat terrain along the diversion alignment would be altered to that of the diversion channel.

4.99 The project contractors would be required to comply with the Corps of Engineers Civil Works Construction Guide Specification entitled "Environmental Protection" (CW-01430, July 1978) which requires implementation of all practical measures to protect water and associated land resources from impacts such as noise, dust, pollution, turbidity, and erosion during project construction.

4.100 Community Cohesion

4.101 No Action (Without Project Conditions). Flooding and associated problems and concerns would be expected to continue. Continued flood insurance and floodplain management and non-structural flood protection measures appear most likely. Continued developmental concerns would be expected.

4.102 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. The project would provide 100 year event level flood protection to localized existing developments (Ransom Oaks) from flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via Black Creek. Several interests would prefer this plan, as compared to a more regional plan, because the project would alleviate flooding problems in the major potential flood damage area with reduced impacts to the remaining floodplain and environment. This plan however, would not significantly alter the 100 year event level floodplain, or significantly address flooding along Tonawanda Creek or the overflow flooding from Tonawanda through Black Creek.

4.103 Plan 11 - Regional Tonawanda Creek Channel Modification and Clarence Diversion. The project would provide 100 year event level flood protection to the floodprone lower Tonawanda, Black, and Ransom Creeks area generally west of Goodrich Road (about 11,000 acres). Most flood damage interests prefer a regional plan, as compared to a more localized plan, because of the 100 year event level of protection and increased area of protection. Project impacts upon the environment (particularly involving aquatic, riparian, facility, property, and farmland environments) however, would be increased accordingly. Some increased urban vs rural development conflicts might be expected.

4.104 The project area townships which would benefit most from this project are Amherst and Clarence. Flood damage reduction benefits for Amherst would be similar for either of the more regional plans considered (Plan 3 and Plan 11). Amherst understandably favors Plan 11 because of similar benefits with reduced costs (monetary and environmental). Flood damage reduction benefits, however, would be greater for Clarence with Plan 3, but at increased overall project cost (monetary and environmental). Although Clarence did not withdraw support from Plan 11, they requested that the Corps examine Plan 3 or other improvements along the Tonawanda Creek Clarence area to the degree possible. They preferred creek modifications, as opposed to a diversion channel, which runs through an existing non-floodplain and agricultural district.

4.105 Of the two more regional plans considered (Plan 3 and Plan 11), Plan 11 was the Federally preferred plan based on overall Federal evaluation criteria. The Plan 11 diversion channel measure, in effect, alleviates Plan 3 overall engineering, economic, environmental, and social problems, associated with Plan 3 Tonawanda Creek channel modification measures.

CULTURAL RESOURCES - ENVIRONMENTAL EFFECTS

4.106 No Action (Without Project Conditions). Similar to existing conditions. The New York State Office of Parks, Recreation, and Historic Preservation indicated in a scoping letter response that the project area is archeologically sensitive and that appropriate cultural resource investigations should be

conducted and coordinated prior to any project implementation. Subsequently a cultural resources survey was contracted and likely potential project impact areas were investigated. Several areas of potential cultural resources significance were identified.

4.108 Plan 4 - Local Ransom (Oaks) Creek Channel Modifications. The New York State Office of Parks, Recreation, and Historic Preservation indicated in a scoping letter response that the project area is archeologically sensitive and that appropriate cultural resource investigations should be conducted and coordinated prior to any project implementation. Subsequently a cultural resources survey was contracted and likely potential project impact areas were investigated. Several areas of potential cultural resources significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to any project construction. Plan 4 would involve three areas.

4.109 Plan 11 - Regional Tonawanda Creek Channel Modifications and Clarence Diversion. The New York State Office of Parks, Recreation, and Historic Preservation indicated in a scoping letter response that the project area is archeologically sensitive and that appropriate cultural resource investigations should be conducted and coordinated prior to any project implementation. Subsequently a cultural resources survey was contracted and likely potential project impact areas were investigated. Several areas of potential cultural resources significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to any project construction. Plan 11 would involve five areas.

SECTION 5 - LIST OF PREPARERS

5.01 The following people are primarily responsible for preparing this Environmental Impact Statement:

<u>Section and Name</u>	<u>Position</u>	<u>Experience</u>	<u>Expertise</u>
<u>Plan Formulation</u>			
Timothy Byrnes	Project Manager	9 Years Plan Formulation Branch, U.S. Army Corps of Engineers, Buffalo	Plan Formulation, Civil Engineering
<u>Environmental Analysis</u>	EIS Coordinators		
Tod Smith	Community/ Environmental Planner	10 years Environmental Analysis Branch, U.S. Army Corps of Engineers, Buffalo	Community/ Environmental Planning, Civil Tech.
Leonard Bryniarski	Senior Ecologist	17 Years Environmental Analysis Branch, U.S. Army Corps of Engineers, Buffalo	Ecology (Aquatic & Terrestrial Biology), Wildlife
Tim Daly	Community Planner	12 Years Environmental Analysis Branch, U.S. Army Corps of Engineers, Buffalo	Cultural Resources Analysis
<u>Economic Analysis</u>			
Roger Haberly	Regional Economist	7 Years Economic Analysis Branch, U.S. Army Corps of Engineers, Buffalo	Economic Analysis

SECTION 6 - PUBLIC INVOLVEMENT

INTRODUCTION

6.01 This section briefly describes the study's Public Involvement Program, Required Coordination, Statement Recipients, and Public Views and Responses.

PUBLIC INVOLVEMENT PROGRAM

6.02 Study activities are coordinated with government agencies, interest groups, and the general public. The general intent is to gain assistance in: identifying and scoping problems, needs, and concerns; developing feasible alternative solutions; and in assessing, evaluating, and identifying preferred and selected plans. This study's public involvement process incorporates public meeting/workshops, written correspondence, telephone communication, and draft and final report review procedures.

6.03 Project scoping letters were sent to entities known to have a potential interest in the project in December of 1988 or January of 1989. Reference the Statement Recipient section which follows. Letter responses included those from: the U.S. Environmental Protection Agency, the U.S. Department of Interior, the U.S. Department of Agriculture, the NYS Department of Environmental Conservation, the NYS Department of Transportation, the NYS Department of Agriculture and Markets, the NYS Office of Parks, Recreation, and Historic Preservation, Niagara County, Erie County, the town of Pendleton, the town of Amherst, the North Amherst Citizens Planning Committee, the town of Clarence. These letters are included in the Environmental Correspondence Appendix which follows.

6.04 A number of project meetings and/or workshops with various interests were conducted including the following:

<u>Date</u>	<u>Meeting/Workshop</u>
11/5/87	Project Interests Orientation Meeting
9/23/88	Workshops with Amherst (T) and Clarence (T)
1/31/89	Meeting with NYS-DOT
2/1/89	Meeting with NYS-DOT - Waterways
2/16/89	Workshop with Amherst (T) and NYSDEC
2/24/89	Workshop with Clarence (T) and NYSDEC
3/1/89	Fieldtrip/Meeting with NYS-DOT - Waterways
4/6/89	Workshop with Clarence (T)
4/18/89	Workshop with Amherst (T)
4/28/89	Project Interests Meeting

5/11/89	Project Interests Meeting
5/11/89	Workshop with Clarence (T)
6/1/89	Project Interests Meeting
6/15/89	Workshop with Clarence (T)
6/21/89	Workshop with Amherst (T)
6/26/89	Project Public Workshop
7/26/89	Meeting with NYSDOT and NYSDEC

REQUIRED COORDINATION

6.05 A Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register June 20, 1989. Notice will be made and the Draft will be coordinated for a 45 day review period. Notice will be made and the Final will be coordinated for a 30 day review period. If approved, a Record of Decision will be signed and coordinated. Subsequently; final planning, engineering, and design; preparation of plans and specifications; and construction would follow.

6.06 Coordination and Compliance. As summarized in Summary Table B, compliance with Federal and State environmental statutes is as follows:

6.07 Preservation of Historical Archaeological Data Act of 1974, 16 USC et seq.; National Historic Preservation Act of 1966, as amended, 16 USC 470 et seq.; Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971. Project coordination was initiate with the U.S. Department of the Interior, and the New York State Office of Parks, Recreation, and Historic Preservation via letter in January of 1989. The New York State Office of Parks, Recreation, and Historic Preservation indicated in their letter response that the project area is archaeologically sensitive and that appropriate cultural resource investigations should be conducted and coordinated prior to any project implementation.

6.08 Subsequently a cultural resources survey was contracted and likely potential project impact areas were investigated. Several areas of potential cultural resources significance were identified and would require some additional investigation and/or coordination and possibly some form of mitigation prior to any project construction.

6.09 Clean Air Act, as amended, 42 USC 7401 et seq. Project coordination was initiated with the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation in this regard. As indicated in this Environmental Statement, no significant adverse impacts to air quality would be expected due to project implementation. This Environmental statement is being coordinated with the U.S. Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC) in this regard.

6.10 Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 USC 1251 et seq. and NYS Environmental Conservation Law - Article 15 (Protection of Water). Project coordination was initiated with the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation in this regard. The New York State Department of Environmental Conservation has classified most of the water bodies in the project area as follows: Tonawanda Creek (B), Erie Barge Canal (C), Ransom Creek (C), Gott Creek (Ct), and Black Creek (D) with expected upgrade to (C). Although some unavoidable short-term adverse impacts (turbidity/sedimentation) would be expected due to project construction, it is not expected that implementation of the considered project would alter classifications. During construction, the contractor would be required to comply with the Corps of Engineers Civil Works Construction Guide Specification entitled "Environmental Protection" (CW-01430 - July 1978) which would require construction related environmental protection measures to avoid or minimize impacts to water and associated land resources. Erosion and sedimentation control measures would be incorporated. With regard to the matter of a Water Quality Certification pursuant to Section 401(a) of the Clean Water Act, the NYSDEC indicated in a letter dated 6 August 1979 (reference the Environmental Assessment Appendices - Environmental Correspondence) that the formality of a Department review and process of an application is considered to be moot by virtue of NYSDEC's participation and henceforth, NYSDEC is waiving Water Quality Certifications on projects where NYSDEC is the local cooperator. NYSDEC is the local cooperator on this project.

6.11 National Environmental Policy Act, 42 USC 470a, et seq. and NYS Environmental Conservation Law. Alternative plans are developed and evaluated in accordance with environmental considerations as set forth by this Act, as promulgated by the Department of the Army's: Principles and Guidelines; ER 200-2-2 Environmental Quality - Policies and Procedures for Implementing NEPA; and COE Section 122 Guidelines. Requirements of the Act are accomplished via the Corps' planning process.

6.12 River and Harbor Act, 33 USC 401 et seq. Requirements of this Act are fulfilled via the Corps permit and planning authorities.

6.13 Fish and Wildlife Coordination Act, 16 USC 661 et seq. Project coordination was initiated with the U.S. Department of the Interior - Fish and Wildlife Service as well as with the NYS Department of Environmental Conservation via letters in this regard. These agencies provided preliminary information and impact assessment pertaining to fish and wildlife resources and threatened or endangered species and/or habitat in the project vicinity. In general, the creeks and project area provide a diversity of quality habitat for a variety of fish and wildlife species. Concerns and recommendations pertain primarily to minimizing impacts to quality aquatic and riparian habitat. Recommendations include: (a) That to minimize impacts on aquatic and riparian habitats, the channelization construction activity in Ransom Creek from the Tonawanda Creek Road bridge to the Hopkins Road bridge be limited to one side only and follow existing channel alignment. Wherever possible, the disturbed side will be that which offers the least amount of habitat for resident species. (b) That to minimize impacts on aquatic and riparian habitats, all clearing and snagging operations be limited to only those bankside and in-water obstructions and debris that clearly impeded water movement. To achieve this,

the project sponsor and representatives of the Service and the State jointly survey the entire project area and designate the obstructions, debris, and vegetation to be removed. (c) That to protect northern pike migrations, as well as other spring-spawning fish species, no (in-stream) construction and maintenance operations shall be carried out between March 1 and June 1. (d) That to minimize impacts on riparian and aquatic habitats, all channel improvement operations be carried out using hand labor and hand tools wherever possible. The use of heavy machinery shall be restricted to the minimum size and amount necessary to perform the task and enter and leave the work site along the single, most direct route. (e) That no woody debris, trash, or excavated material removed from the project sites be disposed of, or stockpiled, in waters or wetlands or the United States. Reference sections in this Environmental Statement pertaining to natural and fish and wildlife resources.

6.14 These recommendations will be implemented to the degree practical and are addressed specifically in the main report.

6.15 The U.S. Fish and Wildlife Service Coordination Act Report is included with this Environmental Impact State as Environmental Appendix EA-C. Reference the Environmental Correspondence Appendix EA-E, also.

6.16 Endangered Species Act, as amended, 16 USC 1531 et seq. Project coordination was initiated with the U.S. Fish and Wildlife Service (USFWS) and the New York State Department of Environmental Conservation (NYSDEC) in this regard. The U.S. Fish and Wildlife Service - Coordination Act Report stated that except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under their jurisdiction are known to exist in the project impact area. The New York State Department of Environmental Conservation indicated in their letter responses the potential for several rare or threatened species of State significance in the Tonawanda Creek vicinity. Reference the Environmental Setting and Environmental Effects sections of this EIS under Threatened/Endangered/Rare species. Proposed project measures (Plan 4), would not significantly impact known high potential protected habitat or species areas; areas previously identified.

6.17 Estuary Protection Act, 16 USC et seq. Not applicable in this case.

6.18 Marine Protection Research and Sanctuaries Act of 1972, as amended, 16 USC 1401 et seq. Not applicable in this case.

6.19 Executive Order 11990, Protection of Wetlands, 24 May 1977 and NYS Freshwater Wetlands Act. Project coordination was initiated with the U.S. Fish and Wildlife Service and the New York State Department of Environmental Conservation in this regard. Review of the Buffalo District's most recent copies of the U.S. Fish and Wildlife Service National Wetland Inventory Maps and the New York State Department of Environmental Conservation Freshwater Wetland Maps indicate that a number of significant wetland areas exist in the regional project vicinity. These wetlands are primarily seasonally flooded wooded wetlands. Plan 4 measures would not be expected to impact any significant wetland areas. Reference Environmental Setting and Environmental Effects sections under Wetlands.

6.20 Federal Water Project Recreation Act, as amended, 16 USC 460-1(12) et seq. Project coordination was initiated with the U.S. Department of the Interior, the U.S. Fish and Wildlife Service, the New York State Department of Environmental Conservation, and the New York State Office of Parks, Recreation, and Historic Preservation. No potential project related recreational development has been made evident or proposed to date.

6.21 Land and Water Conservation Fund Act, 16 USC 4601 et seq. Project coordination was initiated with the U.S. Department of the Interior (USDI). This EIS is being coordinated with the USDI for review of conformance with their comprehensive outdoor recreation plan.

6.22 Wild and Scenic Rivers Act, 16 USC 1271 et seq. In accordance with the National Wild and Scenic Rivers Act, Public Law 90-542, the final lists of rivers identified as meeting the criteria for eligibility dated January 1981 were consulted. Tonawanda Creek nor its tributaries were listed. This EIS is being coordinated with the USDI for review in this regard.

6.23 Coastal Zone Management Act, as amended, 16 USC 1451 et seq. Not applicable in this case.

6.24 Watershed Protection and Flood Prevention Act, 16 USC 1001 et seq. and Executive Order 11988, Flood Plain Management, 24 May 1977. Requirements of the Acts are fulfilled via the Corps planning process. Project coordination was initiated with various agencies including the Federal Emergency Management Agency, the U.S. Department of Agriculture - Soil Conservation Service, and the New York State Department of Environmental Conservation.

6.25 The townships which are located in the project vicinity participate in the regular program of the National Flood Insurance Program administered by the Federal Emergency Management Agency. By this stage, flood insurance and flood plain management maps have been developed and local ordinance pertaining to new or redevelopment in the 100 year event flood plain and flood protection to the intermediate regional or 100 year event flood level have been enacted. In this way, flood insurance would help to compensate residents for flood damages to existing developments, while flood plain development ordinances would reduce the potential of flood damage of any future developments or redevelopments.

6.26 Plan 4 would provide 100 year event level flood protection to localized existing developments (primarily Ransom Oaks) from flooding from Ransom Creek, but only up to 25 year event level flood protection from flooding from Tonawanda Creek via Black Creek. The 100 year event level floodplain would not be altered significantly, and associated National Flood Insurance Policy regulations would remain in effect.

6.27 Much work would occur along Ransom Creek to provide for increase in channel flow capacities. Both short and long term turbidity, erosion, and sedimentation control measures would be incorporated into plan implementation.

6.28 Farmland Protection Policy Act (PL 97-98) and Executive Memorandum - Analysis of Impacts on Prime and Unique Farmlands. Project coordination was initiated with the U.S. Department of Agriculture - Soil Conservation Service

and the NYS Department of Agriculture and Markets in this regard. Most of the project vicinity is identified as 25 to 75 percent prime farmland. Wetness, however, is a limiting use factor in the area.

6.29 Implementation of Plan 4 would require acquisition of about 30 acres of property along the creek for construction of channel improvements. Cleared material (i.e., trees and shrubs) would be processed (cut, bundled) and temporarily stored at the project area staging areas (adjacent several acre site) then disposed of in accordance with the Contractor's approved disposal plan (i.e., permitted clean burn, firewood, landfill). Clean excavated earthen material (about CY) would be deposited on a nearby several acre field area; graded, and revegetated. Most of the project area that would be impacted by Plan 4 is not actively utilized for agriculture.

6.30 A Farmland Conversion Impact Rating Form is being coordinated with the U.S. Department of Agriculture - Soil Conservation Service.

6.31 Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979. Not applicable for this study.

6.32 State and Local.

6.33 The New York State Department of Environmental Conservation who formally initiated the investigation, is the State representative agency on most flood control projects in New York State. Generally, they are supportive of potential flood control projects which can be determined to be engineeringly and economically feasible, environmentally and socially acceptable, and consistent with the project development planning objectives. Scoping letters and Draft and Final planning documentations are coordinated with State and local agencies for compliance with various State and local environmental and land use compliance.

STATEMENT RECIPIENTS

6.34 The following representatives, agencies, and interest groups will receive copies of this report for information, review, and/or comment.

Congressional

U.S. Senator - Daniel P. Moynihan
U.S. Senator - Alphonse D'Amato
U.S. Representative - John J. LaFalce
U.S. Representative - William Paxon

Federal

Advisory Council on Historic Preservation
U.S. Department of Agriculture
" Soil Conservation Service
U.S. Department of Commerce
U.S. Department of Defense
U.S. Department of Energy
U.S. Environmental Protection Agency

Federal Emergency Management Agency
U.S. Department of Health and Human Services
U.S. Department of Housing and Urban Development
U.S. Department of the Interior
° Fish and Wildlife Service
U.S. Department of Transportation

State

Office of the Governor
New York State Clearinghouse
New York State Department of Agriculture and Markets
New York State Department of Commerce
New York State Department of Environmental Conservation
New York State Department of Health
New York State Department of Transportation
New York State Office of Parks, Recreation, and Historic Preservation
New York State Department of State - Coastal Program Office

Regional and Local

Erie and Niagara Counties
Regional Planning Board

Niagara County
Town of Wheatfield
City of N. Tonawanda
Town of Pendleton
Town of Lockport
City of Lockport
Town of Royalton

Erie County
Town of Tonawanda
City of Tonawanda
Town of Amherst
Town of Clarence

Other Organizations

National Wildlife Federation
Sierra Club
Trout Unlimited

Individuals

Individuals are not listed here, but a complete mailing list is on file at the U.S. Army Corps of Engineers, Buffalo District Office.

PUBLIC VIEWS AND RESPONSES

**BUFFALO METROPOLITAN AREA STUDY
LOWER TONAWANDA CREEK**

**ENVIRONMENTAL APPENDIX EA-A
INDEX AND REFERENCES**

**U.S. Army Corps of Engineers
Buffalo District**

BUFFALO METROPOLITAN AREA STUDY
LOWER TONAWANDA CREEK

ENVIRONMENTAL APPENDICES

APPENDIX

EA-A	INDEX AND REFERENCES
EA-B	U.S. FISH AND WILDLIFE SERVICE COORDINATION ACT REPORT
EA-C	CULTURAL RESOURCES
EA-D	ENVIRONMENTAL CORRESPONDENCE

U.S. Army Corps of Engineers
Buffalo District

INDEX AND REFERENCES

Subject	Documentation		
	EIS	Main Report	Report Appendix
Affected Environment	:	:	:
Alternatives	:	:	:
Areas of Controversy	:	:	:
Comparative Impacts of Alternatives	:	:	:
Cover Sheet	:	:	:
Cultural Resources	:	:	:
Environmental Setting	:	:	:
Environmental Effects	:	:	:
Human (Man-Made) Environment	:	:	:
List of Preparers	:	:	:
Major Conclusions and Findings	:	:	:
Natural Environment	:	:	:
NED and Recommended Plan	:	:	:
Need for and Objectives of the Action	:	:	:
Planning Objectives	:	:	:
Plans Considered in Detail	:	:	:
Plans Eliminated from Further Study	:	:	:
Public Concerns	:	:	:
Public Involvement	:	:	:
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Public Views on Responses	:	:	:
Relationship to Environmental Statutes	:	:	:
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Required Coordination	:	:	:
Significant Resources	:	:	:
Statement Recipients	:	:	:
Study Authority	:	:	:
Summary	:	:	:
Table of Contents	:	:	:
Unresolved Issues	:	:	:
Without Conditions (No Action)	:	:	:

REFERENCES

Biological Study Report for Tonawanda, Black, and Ransom Creeks, Erie County, New York; U.S. Department of the Interior - Fish and Wildlife Service, Cortland, New York; 1988.

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A Cultural Resources Survey for the Buffalo Metro-Lower Tonawanda Creek Flood Damage Reduction Feasibility Study, Niagara and Erie Counties, New York, Archaeological Consultants, Phil Salkin, 1989.

Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA), 40 CFR 1500-1508, Council on Environmental Quality, Executive Office of the President.

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U.S. Geological Survey, Area Quad Maps.

BUFFALO METROPOLITAN AREA STUDY
LOWER TONAWANDA CREEK

ENVIRONMENTAL APPENDIX EA-B
U.S. FISH AND WILDLIFE SERVICE
COORDINATION ACT REPORT

U.S. Army Corps of Engineers
Buffalo District



United States Department of the Interior

FISH AND WILDLIFE SERVICE

100 Grange Place
Room 202
Cortland, New York 13045

December 29, 1989

Colonel Hugh F. Boyd III
District Engineer, Buffalo District
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Attention: Len Bryniarski

Dear Colonel Boyd:

Enclosed for your review are two (2) copies of our final fish and wildlife report for the proposed Buffalo Metropolitan Area Feasibility Study of Flood Damage Reduction Measures in the Towns of Amherst and Clarence, Erie and Niagara Counties, New York, by the Buffalo District Corps of Engineers (Corps).

This final report incorporates discussion of additional detailed plans provided by your staff and additional resource information and concerns provided by the New York State Department of Environmental Conservation (State). However, an official response from the State is pending and will be forwarded to your office as soon as received.

No other responses to the draft report other than those of the State were received.

Sincerely,

Leonard P. Corin
ACTING FOR

Leonard P. Corin
Field Supervisor

Enclosure



United States Department of the Interior

FISH AND WILDLIFE SERVICE

100 Grange Place
Room 202
Cortland, New York 13045

December 29, 1989

Colonel Hugh F. Boyd III
District Engineer, Buffalo District
U. S. Army Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Attention: Mr. Len Bryniarski

Dear Colonel Boyd:

This constitutes our final report assessing impacts to fish and wildlife resources that could result from proposed flood damage reduction measures along lower Tonawanda Creek and tributaries in the Towns of Amherst and Clarence, Erie County, New York. It has been prepared under the authority of and in accordance with Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Our report is based on project plans and information provided by your staff, field reconnaissance, a biological survey, coordination with the New York State Department of Environmental Conservation (State), and other information. It was prepared by Thomas H. McCartney, Fish and Wildlife Biologist, under the supervision of Leonard P. Corin, Field Supervisor.

Subsequent to the preparation of this report, the Buffalo District provided us with a revised detailed description of current Plan 11 that presented additional information regarding relocation of a portion of Ransom Creek, the terminus of the diversion channel, the location of the collector ditches, the dimensions of the proposed bridge over the ditch at Tonawanda Creek Road, the rerouting of an existing 20 inch natural gas pipeline under the diversion ditch near the Northfield Road crossing, and the amounts of excavated materials that will be generated by individual project elements.

The State has also provided additional resource information and discussed concerns they have about specific project elements such as excess flow diversions to the Barge Canal and the maintenance of dry channels.

These project updates have been incorporated into this final document and the impact assessment and recommendations have been revised as necessary. In addition, the U. S. Fish and Wildlife Service (Service) and the U. S. Army Corps of Engineers (Corps) have jointly evaluated waterfowl habitat conservation opportunities consistent with the goals of the North American

Waterfowl Management Plan (NAWMP) as described in the 1989 Cooperative Agreement between the Departments of the Interior and Army.

Description of Project

The Corps has undertaken a feasibility study of flood damage reduction measures to be implemented along lower Tonawanda Creek and two tributaries, Black Creek and Ransom Creek (Figure 1). This project is formally known as the Buffalo Metropolitan Area Feasibility Study (BMAFS).

In all, six plans have been considered in detail. Plans 1, 2 and 3, the Amherst Diversion, the Amherst-Clarence Diversion and Tonawanda Creek Improvements, respectively, are not economically justified and have been eliminated from consideration. Plan 4, Ransom Oaks Local Flood Protection, and Plan 11, Tonawanda Creek Improvements and Clarence Diversion, are economically justified and implementable. However, Plan 4 benefits are localized and provide protection against only a 25-year flood event. Plan 11 provides regional benefits and protection against a 100-year flood event. Plan 13 addresses non-structural measures, with three specific measures identified as appropriate solutions to flood hazard; installation of check valves, closure of low openings, and sealing of external surfaces to make them impervious to water. Nonstructural measures apply to individual residential and commercial structures and are recommended with or without structural plans.

The current Plan 11 (Figure 2) combines elements of Plan 4 with the former Plan 11 and has been tentatively identified as the selected plan. It would alleviate some flooding along Tonawanda Creek and nearly all flooding along Black and Ransom Creeks. It involves channel improvements and modifications to the Ransom Creek Channel, channel work in the lower portion of Tonawanda Creek, and a high flow diversion channel.

Ransom Creek and Black Creek Modifications

1. Channelization of Ransom Creek is proposed from the Tonawanda Creek Road bridge, at the confluence of Ransom Creek and Tonawanda Creek (Erie Barge Canal), upstream to the Hopkins Road bridge, a distance of 8,829 feet. This new channel would have a 30-foot bottom width with 1V:2.5H sideslopes and average 16 feet in depth. To avoid cutting into Hopkins Road and removing several homes, it is proposed to move a section of the creek channel 25-35 feet westward (see Figure 2).
2. From the upstream face of Hopkins Road bridge upstream to the downstream face of the Millersport Highway bridge, a distance of 4,378 feet, the channel bed plus 50 feet on each side of the banks would require selective clearing and snagging to pass flood flows. Work will consist of removal of dense brush, loose material, and fallen trees.

FIGURE 2

Channelization ●●●●●
 Clearing and Snagging ○○○○○
 Stream Relocation ———
 Diversion or Cutoffs - - - - -

ERIE CO. NIAGARA CO.
 MILLERSPORT
 CHEEKTOWAKE
 TONAWANDA
 BUFFALO
 NIAGARA FALLS
 NIAGARA GORGE
 NIAGARA RIVER
 NIAGARA CREEK
 NIAGARA LAKE
 NIAGARA FALLS STATE PARK
 NIAGARA FALLS STATE RESERVE
 NIAGARA FALLS STATE HISTORIC SITE
 NIAGARA FALLS STATE MUSEUM
 NIAGARA FALLS STATE GARDENS
 NIAGARA FALLS STATE BOAT LAUNCH
 NIAGARA FALLS STATE FISH HATCHERY
 NIAGARA FALLS STATE BIRDS HATCHERY
 NIAGARA FALLS STATE INDIAN MOUND
 NIAGARA FALLS STATE CEMETERY
 NIAGARA FALLS STATE CHURCH
 NIAGARA FALLS STATE SCHOOL
 NIAGARA FALLS STATE HOSPITAL
 NIAGARA FALLS STATE PRISON
 NIAGARA FALLS STATE JAIL
 NIAGARA FALLS STATE COURT HOUSE
 NIAGARA FALLS STATE OFFICE BUILDING
 NIAGARA FALLS STATE GARAGE
 NIAGARA FALLS STATE FUEL TANK
 NIAGARA FALLS STATE WATER TOWER
 NIAGARA FALLS STATE POWER PLANT
 NIAGARA FALLS STATE WASTE TREATMENT PLANT
 NIAGARA FALLS STATE LANDFILL
 NIAGARA FALLS STATE PUMP STATION
 NIAGARA FALLS STATE SEWER TREATMENT PLANT
 NIAGARA FALLS STATE WATER TREATMENT PLANT
 NIAGARA FALLS STATE WASTE WATER TREATMENT PLANT
 NIAGARA FALLS STATE SOLID WASTE TREATMENT PLANT
 NIAGARA FALLS STATE AIR POLLUTION CONTROL PLANT
 NIAGARA FALLS STATE NOISE ABATEMENT PLANT
 NIAGARA FALLS STATE CLIMATE CONTROL PLANT
 NIAGARA FALLS STATE EARTHQUAKE PROTECTION PLANT
 NIAGARA FALLS STATE FLOOD CONTROL PLANT
 NIAGARA FALLS STATE TERRORISM PROTECTION PLANT
 NIAGARA FALLS STATE CYBER SECURITY PLANT
 NIAGARA FALLS STATE SPACE PROGRAM PLANT
 NIAGARA FALLS STATE NUCLEAR PROGRAM PLANT
 NIAGARA FALLS STATE BIOLOGICAL PROGRAM PLANT
 NIAGARA FALLS STATE CHEMICAL PROGRAM PLANT
 NIAGARA FALLS STATE PHYSICAL PROGRAM PLANT
 NIAGARA FALLS STATE MEDICAL PROGRAM PLANT
 NIAGARA FALLS STATE AGRICULTURAL PROGRAM PLANT
 NIAGARA FALLS STATE INDUSTRIAL PROGRAM PLANT
 NIAGARA FALLS STATE COMMERCIAL PROGRAM PLANT
 NIAGARA FALLS STATE RESIDENTIAL PROGRAM PLANT
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 NIAGARA FALLS STATE RESIDENTIAL PROGRAM PLANT
 NIAGARA FALLS STATE GOVERNMENT PROGRAM PLANT
 NIAGARA FALLS STATE MILITARY PROGRAM PLANT

- Channelization ●●●
- Clearing and Snagging ●●●
- Stream Relocation ●●●
- Diversion or Cutoffs ●●●

3. From the upstream face of the Millersport Highway bridge to the New Road bridge, a cutoff channel along the right bank is required. The cutoff channel will be 800 feet in length and have a 50-foot bottom width with 1V:2.5H sideslopes and 0.001 bedslope at an average depth of 6 feet.
4. From the upstream face of New Road bridge to the downstream face of Glen Oak Drive bridge on Ransom Creek, a distance of 6,549 feet, clearing and snagging of the natural channel would be required.
5. Clearing and snagging of the natural channel of Black Creek would be required from its confluence with Ransom Creek upstream to the downstream face of Smith Road bridge, a distance of 450 feet.
6. Clearing of shoals and sediment from bridge openings would be required on Ransom Creek at Tonawanda Creek bridge, Hopkins Road bridge, and New Road bridge, and on Black Creek at Westphalinger Road bridge.
7. The channel improvements, the cut-off channel, and the removal of shoals and sediments is projected to generate approximately 124,442 cubic yards of excavated materials.

Tonawanda Creek Modifications

1. Channel improvements, clearing and snagging and/or deepening and/or bank sloping, are proposed along the entire length of the project area from the confluence of Tonawanda Creek with the Barge Canal upstream to the confluence with the proposed diversion channel. In addition, 200 feet of riprap protection using a 24 inch depth on a 1V to 3H slope is proposed for the right bank and 70 feet plus/minus on the left bank of Tonawanda Creek in both directions from the diversion channel.

Channel deepening will generate approximately 4,440 cubic yards of excavated materials.

Clarence Diversion Channel

1. Construction of a diversion channel north of the Black Creek system would be required. This channel would begin at its junction with Tonawanda Creek just east of the intersection of Westphalinger Road with Tonawanda Creek Road. From just south of its junction with Tonawanda Creek it proceeds east crossing Northfield Road at a point about midway between Tonawanda Creek Road and Sesh Road. From Northfield Road the channel proceeds directly east then southeast to Sesh Road, roughly paralleling the gas pipeline right-of-way. Then it parallels Sesh Road to its terminus about 400 feet east of Goodrich Road. The diversion channel will have a total length of about 13,000 feet (2.5 miles), a 250 foot average bottom width and 1 vertical on 3 horizontal sideslopes. The depth will vary from 8 feet in the eastern two thirds to 12 feet in the lower third. Riprap is proposed for both sides and the bottom of the diversion channel for approximately 175 feet from its confluence with Tonawanda Creek. Approximately 1,304,900 cubic yards of material will be excavated.

2. A system of collector ditches is proposed in an area surrounded by Goodrich, Tonawanda Creek, Brauer, and Salt Roads to divert floodwaters into the diversion channel.
3. A new bridge would be required on Tonawanda Creek Road just east of Westphalinger Road to span the diversion channel. The new bridge would be 105 feet long and 43 feet wide.
4. Low flow highway crossings would be required at Northfield Road and Goodrich Road. The crossings for these roads would be constructed such that flows of 1,000 cubic feet per second (cfs) (less than a 10-year flood event) or less would flow through a series of culverts under the road. However, flows greater than 1,000 cfs in the diversion channel would flow over the roadway.
5. Near the intersection of the channel and Northfield Road is a 20 inch diameter steel high pressure (650 psi) natural gas pipeline buried about two feet underground and owned by the Tennessee Gas Company. This pipe must be rerouted under the diversion channel where they cross. The new steel pipe cannot have a bend more than 15 degrees; so, it will require about 700 to 800 feet of pipe to bury it three feet under the channel. Before the new hookup can be made, the existing system will be flushed clean.
6. In order to prevent increased damages on the lower Tonawanda Creek and the lower reaches of Ransom Creek near its confluence with Tonawanda Creek as a result of this plan, it would be necessary to divert up to 2,900 cfs of excess flow into the Erie Barge Canal.

Aquatic and Terrestrial Resources

Tonawanda Creek, the largest of the three systems, originates a few miles north of the Village of Arcade in Wyoming County. It flows north through the City of Batavia and then turns to flow in a westerly direction to its confluence with the Niagara River at Tonawanda, New York. The creek is over 100 miles long and drains about 650 square miles. Lands bordering the creek are a mixture of deciduous forest, shrub scrub and old-field meadow, and active agricultural fields. Habitat disturbances are generally limited to road crossings, the City of Batavia and other, smaller, communities along its course, scattered rural/residential development, and agricultural runoff. The centerline of the creek is the boundary dividing Erie and Niagara Counties in the project area.

The project area lies between the Barge Canal confluence at the Hamlet of Pendleton and a point upstream at the intersection of Tonawanda Creek Road and Westphalinger Road, a distance of about 3.6 creek miles. Along this stretch, the creek is bordered almost exclusively by scattered single family residences interspersed with large areas of undisturbed riparian vegetation. There is a marina at Pendleton and a few commercial establishments at the Transit Road (Route 78) crossing at Millersport.

The State classifies Tonawanda Creek as "B" within the project area. Class B waters are suitable for primary contact recreation and any other uses except as a source of water supply for drinking, culinary, or food processing purposes.

Bank vegetation ranges from mature trees to shrub-scrub meadows to lawns mowed nearly up to the water's edge. Ash, willow and box elder are the dominant trees with some alder and eastern cottonwood. Goldenrod, stinging nettle and various grasses are abundant to common. Aquatic vegetation is limited, although spikerush, cattail, pondweed spp., and water milfoil are common to abundant in the western end of the project area and there are scattered patches of water lily. Stream substrate is predominantly hard clay with some muck or detritus overlay. There are riffle-pool complexes scattered throughout the project area. Water depths range from 12 feet at the Barge Canal to 6 feet at the project limit at Westphalinger Road. Widths vary from about 50 to 125 feet.

Fishery resources in this reach have not been extensively characterized but sampling efforts have taken carp, walleye, northern pike, smallmouth bass, largemouth bass, redhorse sucker, brown bullhead, channel catfish, rock bass, golden shiner, and pumpkinseed. The lower reach including the project area provides good to excellent angling opportunities for northern pike, walleye, bass, and panfish.

Other species that benefit from the existing aquatic and terrestrial habitat conditions include waterfowl, mink, muskrat, raccoon, wading birds, raptors, and passerine birds. There is also potential for beaver use as they have been observed in the Barge Canal portion of Tonawanda Creek.

Ransom Creek originates in the Town of Clarence just west of the Village of Clarence and flows northwest for about 20 miles to empty into Tonawanda Creek about one mile east of the Hamlet of Wendelville (intersection of Tonawanda Creek Road and Campbell Boulevard). The creek drains 60 square miles of watershed and is classified as "C" within the project area. Class C waters are suitable for fishing and all other uses except as a source of water supply for drinking, culinary, or food processing purposes, and primary contact recreation.

Development along Ransom Creek follows basically the same pattern as on Tonawanda Creek, primarily single family dwellings and old farms. The chief commercial venture in the project area is the golf course associated with the Ransom Oaks residential development. The development and course border about one mile of the creek east (upstream) of New Road, including the confluence with Black Creek.

Bank vegetation is mixed mature trees, shrub-scrub and meadow interspersed with lawns. Species diversity is similar to that along Tonawanda Creek. Box elder, ash and willow were the dominant trees at survey sites. Wild grape, Virginia creeper, stinging nettle, and pale touch-me-not were common to abundant along with a variety of grasses. Aquatic vegetation is sparse to absent. Stream substrate ranged from gravel to cobble mixed with silt in

places over a clay layer. Depths range from 6 inches to over 4 feet and widths from 10 to 40 feet.

At least fourteen species of fish have been identified in the Ransom Creek project area. Game and panfish include smallmouth bass, largemouth bass, rock bass, northern pike, bluegill and pumpkinseed. Other common species include common shiner, spottail shiner and Johnny darter. Also taken was a rainbow darter (at the Dodge Road crossing just beyond the project area), a species indicative of good water quality.

Most, if not all, of the terrestrial species common to the Tonawanda Creek area can be found in and around Ransom Creek.

Black Creek originates in the Town of Clarence in an area west of Salt Road and north of Delaware Road. The creek flows west for about 7 miles and empties into Ransom Creek about 500 feet southwest of Smith Road in the Town of Amherst. The watershed drainage area is about 14 square miles. Black Creek is class "D" within the project area. Class D waters are suitable for secondary contact recreation, but due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support the propagation of fish.

Development along Black Creek is less intensive than along either Tonawanda or Ransom Creeks and is virtually all agricultural or undeveloped. There is a scattering of residential dwellings.

Bank vegetation ranges from mature trees and shrub-scrub cover to grasses where agricultural lands are worked up to the edge of the stream such as in the Kenfield Road area. Dominant trees are elm spp., red maple, ash and willow spp. Aquatic growth is common to abundant with algae (Cladophora spp.), coontail, sedge, waterweed, and curly-leaved pondweed dominant. Other plants that are common to abundant include goldenrod, thistle, pale touch-me-not, reed canary grass, purple loosestrife and smartweed. Stream substrate varies from gravel to silty gravel mixed with marl. Depths range from 1 to 3 feet and widths from 5 to 30 feet.

At least 15 species of fish are present in Black Creek with large numbers of juvenile central mudminnows, bluegills, and pumpkinseeds present seasonally in the upper reaches. Other species include northern pike, golden shiner, brown bullhead, rock bass, white sucker, and tadpole matdorm. The "D" classification notwithstanding, Black Creek does appear to support the propagation of a significant forage fish and panfish base.

Northern pike reportedly spawn in the upper reaches of Black Creek and this is supported by the finding of a dead adult pike in a field immediately adjacent to Black Creek at the Kenfield Road culvert during an April 1988 field reconnaissance of the project area.

Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further

Section 7 consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) is required with the Service. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

The longear sunfish, the brindled madtom and nine species of freshwater bivalves ranked as rare by the New York Natural Heritage Program have been taken in various parts of lower Tonawanda Creek within or near the project area.

Impact Assessment

✱ The primary impacts of Plan 11 on fish and wildlife resources will most likely be severe. The proposed flood damage reduction measures can be expected to significantly lower the habitat suitability of the affected areas of Tonawanda, Ransom and Black Creeks. These waterways provide excellent riparian and aquatic habitat for a variety of aquatic and terrestrial species.

There are particular concerns about the impacts on the fisheries in the respective streams. Ransom Creek apparently serves as a migration corridor for northern pike spawning in Black Creek as well as in Got Creek, a tributary just above the project area, and for the emigration of juvenile pike back down from the nursery habitat to contribute to the northern pike fishery in lower Tonawanda Creek and the Barge Canal. Other species such as walleye and smallmouth bass may use the waters as spawning and nursery areas as well.

Riparian vegetation provides streambank stability, shading, and cover. The loss of riparian vegetation leads to destabilization and accelerated erosion of banks, promotes warming of stream waters, and consequently lowers habitat diversity and suitability.

A secondary, but very important, impact would be the effect of flood risk reduction on future development within the project area. Reduced risk will most likely lead to increased development pressure on remaining habitat resources. This invariably leads to a call for eliminating flood risk altogether and this would result in sacrificing the remaining quality of the aquatic and riparian systems.

The following comments are specific to modifications and measures proposed under Plan 11.

Ransom and Black Creeks

1. The channelization of 1.7 miles of Ransom Creek and the relocation of portions of the creek westward will result in severe impacts on the riparian corridor. The diversity and quality of the aquatic and bankside terrestrial habitat will be significantly reduced. Also, since all bankside trees and other woody vegetation will be removed, stream shading will be reduced to where, during summer months, creek waters could warm to the point of creating stagnant conditions that promote nuisance growths of aquatic vegetation and reduced dissolved oxygen conditions stressful or lethal to fish.

In addition, a wide uniform box-cut channel could promote siltation in this reach with the need for periodic maintenance dredging. Projected dredging and disposal requirements have not been addressed in the project proposal.

2. The snagging and clearing proposed for 0.8 mile of Ransom Creek will severely impact the quality of the aquatic and riparian habitat along this section of creek. The Service considers snagging and clearing as removal of only those instream debris obstructions that clearly impede flow, with only limited removal of trees and other woody vegetation from the banks. The degree of snagging of the natural channel and the selective clearing proposed for a 50 foot corridor along each side of the channel exceeds this criteria and will contribute to reduced habitat diversity and quality in this reach.
3. The proposed 800 foot long cutoff channel between Millersport Highway and New Road will impact approximately 1.6 acres of terrestrial habitat. Since this is a dry channel, the impacts would be short-term. The channel should revegetate over a period of time with only occasional periodic inundation. There would be short-term displacement, with perhaps some loss, of resident species.

It is our understanding, however, that the dry channel would be mowed at least twice a year to discourage reestablishment of woody plants. This will keep habitat diversity at a low level and will be disruptive to ground-nesting species of birds and mammals.

4. Clearing and snagging of 1.25 miles of Ransom Creek between New Road and Glen Oak Drive would result in the same impacts described in items 1 and 2.
5. Clearing and snagging of 450 feet of Black Creek from its confluence to Smith Road Bridge would result the same impacts described in items 1 and 2 but on a reduced scale.
6. The removal of shoals along the stream and at bridge openings will result in the loss of shallow habitat favored by many shiners and darters that provide a rich forage base for game fish.
7. It will be necessary to find a suitable disposal site (or sites) for the nearly 125,000 cubic yards of excavated materials generated by this phase of the project.

Tonawanda Creek

1. Impacts of snagging and clearing, bank sloping, and channel deepening will be essentially the same as those described above for Ransom Creek. Riparian and aquatic habitat will be lost and habitat diversity will be lowered. As Tonawanda Creek is a larger stream than either Ransom or Black Creeks, the impacts can be expected to be proportionately greater. Riprap, under some circumstances, can enhance aquatic habitat but the gain

would be minor compared to the loss of habitat resulting from implementation of the other measures.

2. Approximately 4,500 cubic yards of excavated materials will require proper disposal.

Clarence Diversion Channel

1. The 2.5 mile diversion channel will impact approximately 93 acres of mixed upland habitat which supports numerous species of mammals, birds, reptiles, and amphibians. As the channel is planned as a dry channel except for seasonal flood flows, some impacts will be short-term since revegetation will begin to establish almost immediately after construction. However, plans to mow the channel at least twice a year would have the same impact as at the Millersport cutoff except on a much larger scale.
2. The system of collector ditches east of Goodrich Road should have no significant long-term impact on existing habitat. However, the project description does not give any specific details regarding dimensions, numbers, or configuration of the proposed ditches so we are unable to make a specific assessment. A detailed assessment of the hydrological regime may be necessary to guard against affecting both the nearby Black Creek drainage and wetlands in the immediate vicinity.
3. The proposed bridge on Tonawanda Creek Road spanning the proposed diversion channel will not impact aquatic resources and impacts on terrestrial resources will be minimal. Riprap extending below the ordinary high water line in Tonawanda Creek can provide some habitat for benthic organisms and cover for juvenile fish.
4. The low flow culverts at Northfield Road and Goodrich Road should not have significant long-term impacts on fish and wildlife resources.
5. The flushing of the gas pipeline associated with the rerouting near Northfield Road could result in PCB's being released into the environment. More information is needed regarding how this operation is to be carried out and where the waste water is to be dumped.
6. The diversion of excess flows of up to 2900 cfs to the Barge Canal could, depending upon timing and duration, flush fish eggs and/or larvae from Tonawanda Creek.

Plan of Development for Aquatic and Terrestrial Resources

In accordance with the Service Mitigation Policy, the northern pike and the red-tailed hawk were selected as evaluation species for the project area.

The Service designates Tonawanda Creek and its tributary streams in the project area as Resource Category 3 in recognition of their high to medium value for warmwater species such as northern pike and the relative abundance of this type of habitat. The undeveloped wooded, meadow, and agricultural

lands surrounding project waters are also designated as Resource Category 3 in recognition of their high to medium value for species such as the red-tailed hawk and the relative abundance of this type of habitat. The mitigation goal for Resource Category 3 habitats is no net loss of value, while minimizing in-kind habitat loss.

In addition, the 1989 Cooperative Agreement between the Interior and Army is a mechanism for the Service and the Corps to jointly identify waterfowl habitat conservation and development opportunities associated with civil works projects that would address regional and national goals that are consistent with the NAWMP.

Opportunities associated with the BMAFS are limited but the Service suggests that the Corps consider the creation of one or more pothole ponds along the route of the proposed diversion channel. These ponds, with nesting islands placed in the center, could encourage additional waterfowl to remain and breed in this area.

X To minimize or eliminate adverse riparian and aquatic impacts associated with implementation of this project, the clearing for channelization of Ransom Creek should be limited to one side only. This would also serve to eliminate the need to relocate portions of the creek if channelization is restricted to the west side in those sections. The cleared areas should be replanted with a mixture of grasses and woody vegetation characteristic of the area. Drift and debris removal should be limited to in-water obstructions and only those that clearly impede water movement. This can be assessed on a case-by-case basis. If necessary to remove bank vegetation, it should only be that which is lying loose on the ground, that which is dead or dying, or if living, in eminent danger of falling into the waterway due to erosion forces.

?- To protect against migrating fish being stranded in the 800 foot long cutoff channel when flood water recede, a pilot channel should be constructed in the bottom of the cutoff to enable fish to find their way into the main stream channel during low flow conditions. The pilot channel should be constructed in an "S" curve or meandering configuration to approximate normal stream bed conditions.

To promote revegetation of dry cutoffs or diversion channels, plantings of selected grass-legume mixtures should be carried out immediately following construction. Annual mowing of such channels should be eliminated. Woody vegetation that could eventually impede flood runoff can be removed on a selective basis as needed.

X In order to minimize in-kind habitat loss and preserve the net value of the terrestrial habitat, a buffer strip at least as wide as the top width of the proposed Clarence Diversion Channel, should be acquired along the length of the proposed channel and protected against further development or agricultural use. The buffer strip could be along one side only or divided equally along both sides.

In order to protect northern pike spawning migrations and subsequent out-migrations of juveniles, as well as other spawning warmwater species, no construction activities should be carried out between March 1 and June 1.

To minimize impacts of heavy vehicular traffic on riparian and aquatic habitat, all in-water and bankside channel improvement operations should, wherever possible, use only hand labor and tools, and only the minimum amount and size of machinery necessary to do the task. Heavy equipment should enter and return from the work site by the most direct common route.

To minimize the potential impacts of diverting excess flows to the Barge Canal on fish eggs and larvae, the timing and duration of flow releases should be coordinated with State biologists.

No debris or excavated materials removed from the project sites should be disposed of, or stockpiled in, any wetlands or other aquatic habitats of the United States. Detailed disposal plans including a description of proposed disposal areas should be formulated and presented for joint review by the Service and the State prior to project implementation.

Recommendations

We recommend:

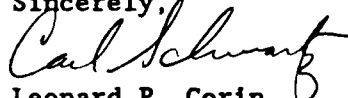
1. That to minimize impacts on aquatic and riparian habitats, the channelization construction activity in Ransom Creek from the Tonawanda Creek Road bridge to the Hopkins Road bridge be limited to one side only and follow existing channel alignment. Wherever possible, the disturbed side will be that which offers the least amount of habitat for resident species.
2. That to minimize impacts on aquatic and riparian habitats, all clearing and snagging operations be limited to only those bankside and in-water obstructions and debris that clearly impede water movement. To achieve this, the project sponsor and representatives of the Service and the State will jointly survey the entire project area and designate the obstructions, debris, and vegetation to be removed.
3. That to accelerate revegetation of the diversion and the cutoff, they be replanted with a selected mixture of grasses and legumes immediately following construction.
4. That a pilot channel be constructed in the bottom of the 800 foot long cutoff channel to enable fish to escape being stranded after flood waters have receded.
5. That to preserve terrestrial habitat diversity, a buffer strip be acquired and set aside from further development along the length of the Clarence Diversion Channel. The buffer strip shall be at least as wide as the top width of the proposed channel and can be along one side only or equally divided along both sides.

6. That to protect northern pike migrations, as well as other spring-spawning fish species, no construction and maintenance operations shall be carried out between March 1 and June 1.
7. That to minimize impacts on riparian and aquatic habitats, all channel improvement operations be carried out using hand labor and hand tools wherever possible. The use of heavy machinery shall be restricted to the minimum size and amount necessary to perform the task and will enter and leave the work site by the most direct route.
8. That the timing and duration of excess flow releases to the Barge Canal be coordinated with the appropriate State fishery biologist.
9. That no woody debris, trash, or excavated material removed from the project sites be disposed of, or stockpiled, in waters or wetlands of the United States and that a detailed disposal plan be submitted for agency review prior to project implementation.

Please continue to coordinate this project with us as it develops, and advise us of any changes or refinements in project plans so that we may revise or supplement our report.

ACTING FOR

Sincerely,


Leonard P. Corin
Field Supervisor

BUFFALO METROPOLITAN AREA STUDY
LOWER TONAWANDA CREEK

ENVIRONMENTAL APPENDIX EA-C
CULTURAL RESOURCES

U.S. Army Corps of Engineers
Buffalo District

DEC 18 1989

12/11/89

Environmental Analysis Branch

SUBJECT: Archaeological Reconnaissance Report for Proposed Flood Reduction Measures Along Tonawanda and Ransom Creeks, Erie and Niagara Counties, New York

Ms. Julia S. Stokes
Deputy Commissioner for
Historic Preservation
New York State Office of Parks,
Recreation, and Historic Preservation
Empire State Plaza
Agency Building 1
Albany, New York 12238

18 DEC 89 11 25

HATRON MEMO-S

Dear Ms. Stokes:

Enclosed for your review is a cultural resources report entitled, An Archaeological Reconnaissance Survey Along Areas of proposed Flood Reduction Measures on Tonawanda and Ransom Creeks in Erie and Niagara Counties, New York, by Philip H. Salkin, September 1989.

Please review this document with respect to its adequacy and compliance with applicable historic preservation laws and regulations, and forward any comments you may have to me within 30 days of your receipt of this letter.

My point of contact pertaining to this matter is Mr. Timothy Daly of my Environmental Analysis Branch, who can be contacted by calling 716-879-4171, or by writing to the above address.

The Buffalo District -- Leadership in Engineering.

Sincerely,

JOHN ZORICH

John Zorich, P.E.
Chief, Planning Division

Enclosure

CF:
CENCB-PD-ER
CENCB-PD
CENCB-PD-PF

Concur:
CENCB-PD-PF
T. Byrne

Daly/lb 12/14
Bennett 12/14
Zorich 12/15



REPORTS OF INVESTIGATIONS

AN ARCHAEOLOGICAL RECONNAISSANCE SURVEY ALONG
AREAS OF PROPOSED FLOOD REDUCTION MEASURES ON
TONAWANDA AND RANSOM CREEKS IN ERIE
AND NIAGARA COUNTIES, NEW YORK

SEPTEMBER, 1989

REPORT NUMBER

547

PREPARED BY

PHILIP H. SALKIN

ARCHAEOLOGICAL CONSULTING AND SERVICES

SUITE 1 111 E. VERONA AVE.

VERONA, WISCONSIN

**AN ARCHAEOLOGICAL RECONNAISSANCE SURVEY ALONG
AREAS OF PROPOSED FLOOD REDUCTION MEASURES ON
TONAWANDA AND RANSOM CREEKS IN ERIE
AND NIAGARA COUNTIES, NEW YORK**

SUBMITTED TO: Buffalo District
U.S. Army Corps of Engineers
1776 Niagara St.
Buffalo, New York 14207

SUBMITTED BY: Archaeological Consulting and Services
Suite 1 111 East Verona Ave.
Verona, Wisconsin 53593

CONTRACT NO.: DACW4989M0547

DATE OF FIELD WORK: September, 1989

PRINCIPAL INVESTIGATOR: Philip H. Salkin

ARCHAEOLOGICAL CONSULTING AND SERVICES REPORT NO.: 547

ABSTRACT: In September, 1989, the author conducted an archaeological survey of proposed flood control project areas on Tonawanda and Ransom Creeks in Erie and Niagara Counties, New York. In the course of the field work, the project areas were subjected to pedestrian survey and the excavation of several dozen shovel test units. Numerous shovel probes were also excavated. The survey was sufficient to indicate that most of the project areas are relatively low and poorly drained or disturbed. One prehistoric occupation, the Shantz/Fenning Site was encountered and a pre-1928 bridge abutment was found in project areas. Portions of another area could not be investigated due to a lack of access. Additional study is recommended for the prehistoric site, the bridge abutment and the unsurveyed area if they are to be subject to project impacts.

BUFFALO METROPOLITAN AREA STUDY
LOWER TONAWANDA CREEK

ENVIRONMENTAL APPENDIX EA-D
ENVIRONMENTAL CORRESPONDENCE

U.S. Army Corps of Engineers
Buffalo District

NOTE: Environmental Correspondence has been integrated into
project Appendix F - Public Involvement and Correspondence.